OCCIDENTAL CHEMICAL CORPORATION

Special Environmental Programs
Niagara Falls, New York

Report of Groundwater & Soils Investigation at The Former Ruco Division Plantsite Hicksville, New York

SECTION III

Analytical

October 1984

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REFERENCES

1). Proposed Hicksville Plant Groundwater Study, D. R. Thielen and R. G. Badger, 4/03/83.

2). Parsons, F., Lage, G, Rice, R., Astvaskis, M., and Nassau, R., "Behaviour and Fate of Hazardous Organic Chemicals in Contaminated Groundwater", Report to Florida Department of Environmental Regulation, December 1982.

3). Wood, P. R., Parsons, F., Lang, R. F., Payan, I. L., Espinet-Tracey, S. S., and Harwin, H. J., "Pilot Plant Project for Removing Organic Substances from Drinking Water", EPA Report EPA600/2-84-009, January, 1984.

4). Harris, D., and Davids, H. W., "Interim Report #2, Vinyl Chloride Contamination of Groundwater, North Bay Shore, New York", Suffolk County Department of Health Services, November, 1983.

CONCLUSIONS

Soil - Well Sites

With the exception of sites E and F, soil from the well sites did not show the presence of organic or inorganic compounds at significant levels. At site E, tetrachloroethylene was found at a level of 240 ppm in a sample near the surface with much smaller amounts in deeper samples. Very low concentrations of Aroclor 1248 (less than 1 ppm) were also detected in some of these soils. At site F tetrachloroethylene only was found in much smaller concentrations (less than 2 ppm) in samples at 36 and 46 feet below grade level. Sites B and C each had one sample (the uppermost one) with less than 0.4 ppm of tetrachloroethylene. Sites C and D had very low concentrations of Aroclor 1248 (less than 1 ppm) in three of the seven samples analyzed.

Groundwater

Water samples from twelve locations were analyzed for a variety of parameters. None of the organic compounds analyzed for were found in six of these locations. Of the remaining six locations, two had only one compound, three had two compounds and one had three compounds. Only four values were over 50 ppb and none were over 200 ppb. Vinyl chloride was found at concentrations of 7, 140 and 50 ppb at sites E-1, F-1 and F-2 respectively. TOC and COD values at sites C-1, D-1, E-1, E-2, F-1 and F-2 indicate the possible presence of additional organic or oxidizable compounds at these sites. There is no consistent pattern of groundwater contamination by organics found in the soil samples.

Soil - Therminol Spill Area

In the limited area of the therminol spill region, Aroclor 1248 was found near the surface at the four sites samples. There was a rapid decrease of concentration with increasing depth. A value of less than 50 ppm was reached at a depth between 2.5 and 8 ft.

1.0 SAMPLING

1.1 Introduction

All soil and water sampling was done by personnel from the firm of Leggette, Brashears and Graham. The general principles were outlined in the Proposed Hicksville Plant Groundwater Study document[1] which is included in this report as Appendix B-1. Additional details are given in this report in Section II - Hydrogeology. All samples were split with the NYS DEC representative who was present for all sampling operations.

1.2 Soil - Well Sites

The general procedure for sampling soil from the well sites was to use a split spoon in advance of the casing. Samples were taken at 5 foot intervals from the surface down to the top of the saturated zone. At each site, three of these samples were selected for analysis, while the others were archived at the analytical laboratory.

The initial work at Site E encountered an oily material at approximately 48 feet below grade. Samples of soil and water with this material were taken for limited worker health related analysis at the Occidental Chemical Corporation's laboratory at Grand Island, NY. This material was not observed in a subsequent resampling from a spot about 5 feet east of the original site. Additional detail is supplied in Section II (Hydrogeology) of this report. The site locations are shown in Figure 1.1. Note that samples F-36 and F-61 were from the actual location of the F wells at the edge of the sump.

Figure 1.1
Monitor Well Locations

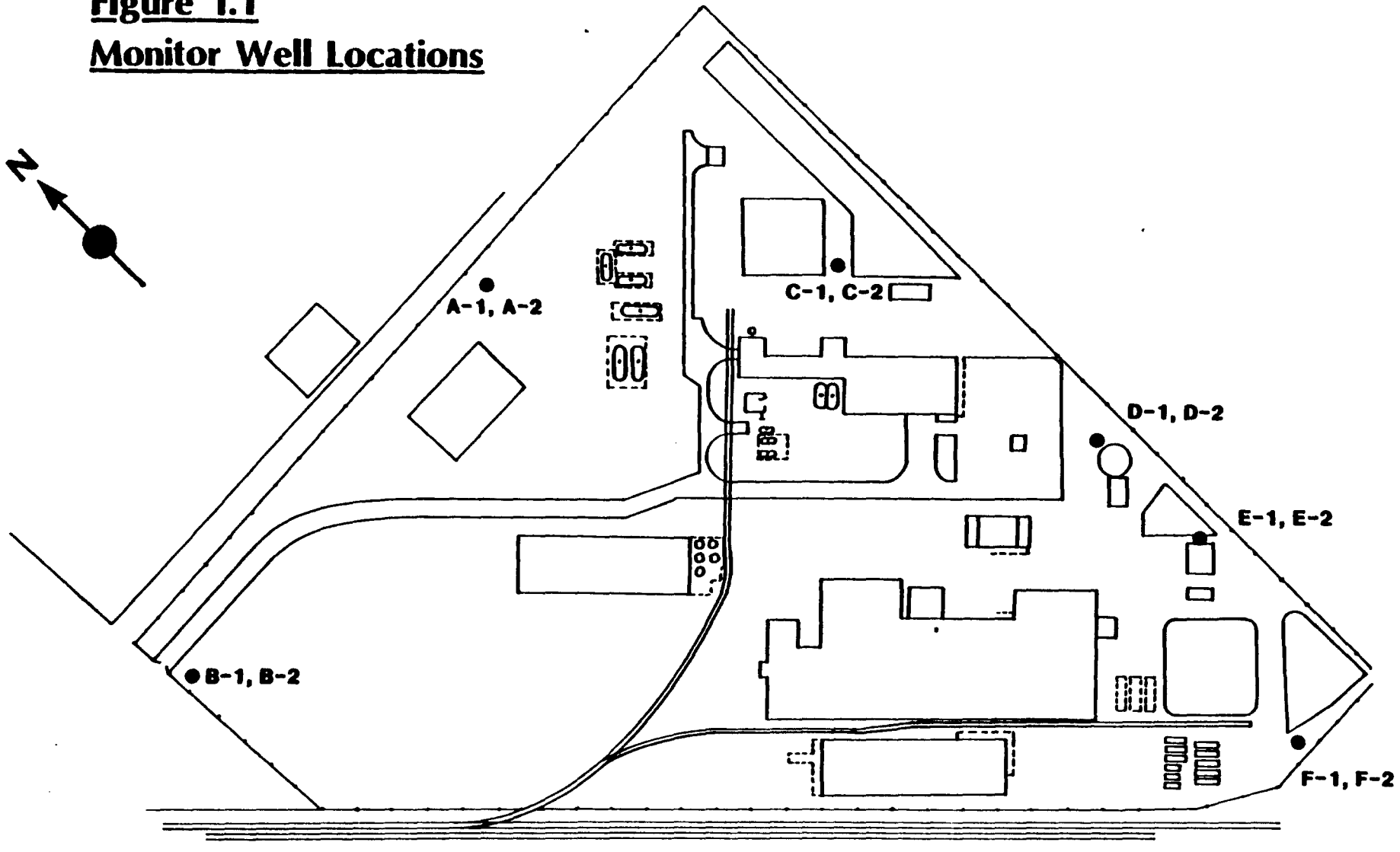
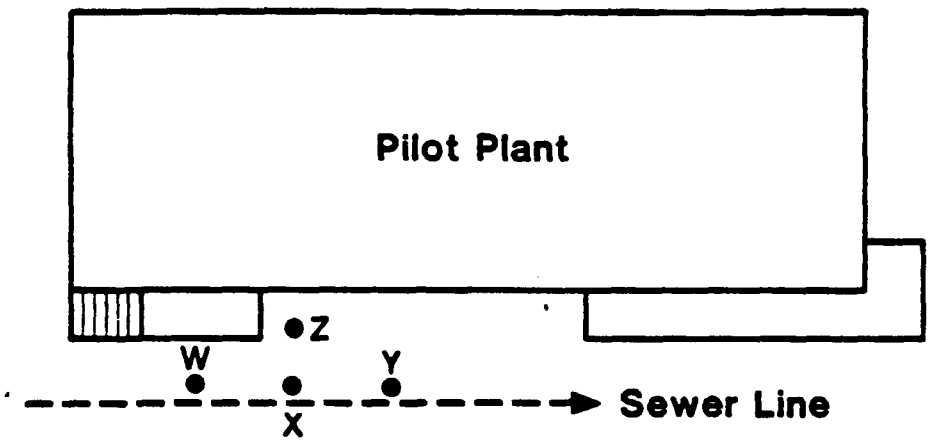
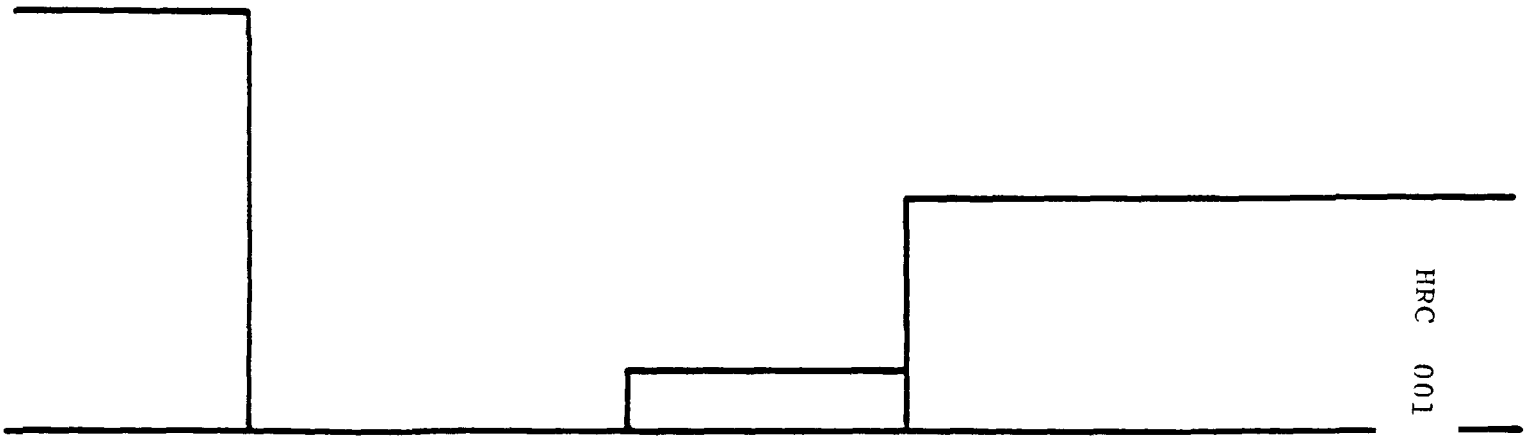


Figure 1.2

Locations of Pilot Borings

1 inch = 20 feet





1.3 Groundwater

The procedure for water sampling was to use a small submersible pump for purging the well casing and taking the samples except for volatiles. A manual bailer was used to obtain volatiles samples. Details on the procedures used and observations made are provided in Section II (Hydrogeology) of this report. The sampling site locations are shown in Figure 1.1.

1.4 Soil - Therminol Spill Area

The therminol spill area is presently paved with asphalt. The soil samples were taken starting just below the paving. Continuous split spoon samples were taken except for the uppermost sample which was taken manually. The sites for sampling in this area are shown in Figure 1.2.

2.0 ANALYTICAL RESULTS

2.1 Introduction

The analysis results reported here were obtained by the Environmental Testing and Certification Corp. (ETC), Edison, NJ. The analytical methods were those specified in the original proposal (Appendix B-1). These methods are given in Appendix B-2. A complete set of the ETC reports is available in Appendix B-4 (bound separately).

Comments on the quality assurance of the analytical work are found in Section 4.0. As noted in 4.3.1, the EPA method used to determine the phthalates proved to be inadequate. The magnitude of this problem and

SITE 2.1

HICKSVILLE WATER SAMPLE ANALYSIS[c]

	MDL (ug/l)[**]	N (DUPLICATE) City Water	FIELD BLANK Cooling Blank	REDUNDANT Blank (b)	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F2
1,1-Dichloroethylene	10	ND 100	ND 100	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
Tetrachloroethylene	10	ND 100	ND 100	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	50	160	ND 10	ND 10	ND 10	ND 10	ND 10
Toluene	10	ND 100	ND 100	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1,2-Transdichloroethylene	10	ND 100	ND 100	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	24	ND 10	30	ND 10	130	200
Trichloroethylene	10	ND 100	ND 100	ND 10	ND 10	25	ND 10	ND 10	ND 10	ND 10	16	ND 10	ND 10	ND 10	ND 10	ND 10
Vinyl Chloride	5	ND 100	ND 100	ND 5	ND 5	ND 5	ND 5	ND 5	ND 5	ND 5	ND 5	ND 5	7	ND 5	140	50
Styrene	10	ND 100	ND 100	ND 5	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
Bis(2-Ethylhexyl)phthalate	10	ND 10	ND 13	ND 10	ND 10	NB 10	*	*	ND 10	ND 10	NB 10	ND 10	ND 10	ND 10	ND 10	ND 10
Butylbenzylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octylphthalate	10	ND 10	ND 13	ND 10	ND 10	ND 10	*	*	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
Mxca	10	ND 25	*	ND 10	ND 10	ND 10	*	*	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 25
Arochlore 1262	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1254	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1260	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1248	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1232	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1221	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
1016	10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10	ND 10
Cadmium	50	ND 6	ND 6	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50
Copper	200	ND 20	20	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200	ND 200
Lead	6	8.0	9.0	ND 6	ND 6	ND 6	ND 6	ND 6	ND 6	ND 6	ND 6	NB 6	ND 6	ND 6	ND 6	ND 6
Mercury	0.3	ND 0.1	ND 0.1	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3	ND 0.3
Zinc	50	ND 10	ND 10	60	64	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	ND 50	84	ND 50	ND 50	ND 50
Barium	1000	ND 6	ND 6	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000	ND 1000
Sulfate as SO_4 (mg/L)	2	ND 2	ND 2	ND 2	33	15	20	34	4	36	19	27	ND 2	ND 2	4	5
COD (mg/L)	2	-	-	ND 2	3	4	3	4	13	3	9	ND 5	25	15	46	44
Nitrate as N (mg/L)	0.1	-	-	ND 0.1	13	1.7	1.1	2.2	1.1	1.2	ND 0.1	0.53	ND 0.1	ND 0.1	ND 0.1	0.17
Specific Cond. (umhos/cm)[a]	100	-	-	6400	300	170	220	240	110	170	240	200	180	280	290	600
pH	-	-	-	6.7	6.8	7.0	7.9	7.1	7.5	7.5	6.1	6.7	6.7	8.8	6.4	6.2
Phenolics (Total) (mg/L)	0.05	-	-	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05[d]	ND 0.05[d]	ND 0.05
TOC (mg/L)	1	-	-	1,1,ND,ND	1.2	1.5	1.6	1.4	4.2	1.8	2.6	1.3	0.2	0.7	22	16
ETC No.		D3762	D3763	D9766	D8921	D3907	D3915	D3913	D3911	D3917	D3918	D3916	D8567	D3912	D9921	D9922

* - No detection limit established
** - Detection Limit (DL) except where otherwise stated.
- - Not analyzed
(a) - 1984 Field Notes except for 6400 value.
(b) - Field Blank - Blank water through the pump & tubing and from the bailer.
(c) - ND 20 means not detected at or above the concentration of 20.
(d) - Average of 4 determinations.

TABLE 2.7

HICKSVILLE SOIL SAMPLE SITES AT VARIOUS DEPTHS[b]

Parameter	MDL[oo] (ug/kg)	A-5	A-25	A-50	B-5	B-25	B-50	C-6[a]	C-31[a]	C-56[a]	D-5	D-25	D-50	D-55	E-7[a]	E-6[a]	E-25[a]	E-51[a]	E-55	E-60	F-17	F-36	F-46	F-36[a]	F-61[d,e]
1,1-Dichloroethylene	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
Tetrachloroethylene	100	ND 100	ND 100	ND 100	110	ND 100	ND 100	[illegible]	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	[illegible]	[illegible]	[illegible]	ND 1000	-	-	ND 100	[illegible]	[illegible]	ND 100	ND 100
Toluene	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
1,2-Transdichloroethylene	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
Trichloroethylene	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
Vinyl Chloride	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
Styrene	100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 100	ND 500	ND 100	ND 100	ND 100	ND 100	ND 5000	ND 100	ND 100	ND 1000	-	-	ND 100	ND 100	ND 100	ND 100	ND 100
Bis(2-Ethylhexyl)phthalate	*	ND 333	ND 333	ND 333	ND 330	ND 366	ND 350	ND	ND 200	ND 200	ND 333	ND 222	ND 233	ND 222	ND 13	ND 200	ND 200	ND 278	-	-	ND 256	ND 244	ND 270	ND 233	ND 233
Butylbenzylphthalate	*	ND 333	ND 333	ND 333	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND 278	-	-	ND	ND	ND	ND	ND
Diethylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND 200	ND 200	ND	-	-	ND	ND	ND	ND	ND
Dimethylphthalate	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND	ND	ND	ND	ND
Di-n-Butylphthalate	*	ND 333	ND 333	ND 333	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND 200	ND 200	ND	-	-	ND	ND	ND	ND 233	ND 233
Di-n-Octylphthalate	*	ND 333	ND 333	ND 333	ND	ND	ND	ND	ND	ND	ND 333	ND 222	ND 233	ND 222	ND 13	ND 200	ND 200	ND	-	-	ND	ND	ND	ND	ND
Mono	*	ND 333	ND 333	ND 333	ND 330	ND 366	ND 350	ND	ND	ND	ND 333	ND 222	ND 233	ND 222	ND	ND 500	ND 500	ND 556	-	-	ND 256	ND 244	ND 270	ND 583	ND 583
Aroclor 1016 (ug/kg)	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1221 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1232 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1242 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1248 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	0.53	0.12	ND 0.1	0.21	ND 0.1	ND 0.1	ND 0.1	0.04	0.16	0.1	0.27	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1254 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
1260 "	0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
Barium (ug/L)[ooo]	1.0	ND 1	ND 1	ND 1	ND 5	ND 1	ND 100	ND 100	ND 100	ND 100	ND 1	ND 1	ND 1	ND 1	-	ND 1	ND 100	ND 100	-	-	ND 1	ND 1	ND 1	ND 0.5	ND 0.5
Cadmium "	0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.5	ND 0.5	ND 0.05	ND 1	ND 1	ND 1	ND 0.05	ND 0.05	ND 0.05	ND 0.05	-	ND 1	ND 1	ND 1	-	-	ND 0.05	ND 0.05	ND 0.05	ND 0.2	ND 0.2
Copper "	0.02	ND 0.2	ND 0.2	ND 0.2	ND 0.2	ND 0.2	ND 0.2	ND 0.2	ND 0.02	ND 0.2	ND 0.2	ND 0.2	ND 0.2	ND 0.2	-	0.04	ND 0.2	ND 0.2	-	-	ND 0.2	ND 0.2	ND 0.2	0.02	0.06
Lead (ug/L)	5	ND 200	ND 200	ND 50	ND 6	ND 6	ND 10	11	7	ND 200	ND 5	ND 10	5	6	-	17	8	ND 200	-	-	260	120	110	ND 0.8	ND 0.8
Mercury "	0.2	ND 1	ND 1	ND 1	ND 1	ND 1	ND 1	ND 2	ND 5	ND 1	0.1	ND 0.1	[illegible]	[illegible]	-	ND 0.2	ND 0.2	ND 2	-	-	ND 0.1	ND 0.1	ND 0.1	ND 0.1	ND 0.1
Zinc (ug/L)	0.05	0.34	0.43	0.22	0.2	0.2	ND 0.05	0.05	0.15	0.05	0.11	0.10	0.06	0.45	-	1.2	0.07	0.22	-	-	0.22	0.65	0.21	0.4	0.6
Nitrate as N (ug/L)	0.04	ND 0.1	ND 0.1	ND 0.1	0.31	0.19	0.17	0.10	0.13	0.04	1.5	0.12	ND 0.1	ND 0.1	0.25	-	0.30	0.27	-	-	0.19	0.13	0.25	0.10	0.04
Phenolics (Total) "	0.05	0.06	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05	-	ND 0.05	ND 0.05	-	-	ND 0.05	ND 0.05	ND 0.05	ND 0.05	ND 0.05
Sulfate as SO_4 "	9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	ND 9	-	ND 9	ND 9	-	-	ND 12	12	ND 9	ND 9	ND 9
QEC No.		C5429	C5433	C5460	C7362	C7336	C5446	C3597 C5374[a]	C5439 C5375[a]	C5456 C5376[a]	C5449	C5453 *	C5413	C5419	C5236 C5304[a]	C5267 C5305[a]	C5240 C5299[a]	C5396 C5360[a]	C5371	C5372	C5445	QC5440	C5300	C5426	C5430

A - No Detection Limit established.
oo - Detection Limit except where otherwise noted.
ooo - All parameters below are the analysis of liquid from EP Toxicity Test Procedures, Resource Conservation and Recovery Act.
- - Parameters not determined.
(a) - Separate sample for Aroclor analysis.
(b) - The numeral in the column heading is the approximate sample depth (feet) below grade.
(c) - ND means not determined at or above the concentration of xx.
(d) - Sample taken from the driller's trough.
(e) - Samples taken from second boring at rim of sump.

HRC 003 0261

TABLE 2.4

HICKSVILLE SOIL FROM THERMINOL SPILL AREA[a,b]

Site	Depth (ft.)	ETC No.	1061	1221	1232	1242	1248	1254	1260
W	1	D5513	ND_{500}	ND_{500}	ND_{500}	ND_{500}	20,000	ND_{500}	ND_{500}
	1 - 2.5	D5514	ND_{500}	ND_{500}	ND_{500}	ND_{500}	2,200	ND_{500}	ND_{500}
	2.5 - 4	D5515	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
	4 - 5.5	D5516	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	3.3	$ND_{0.5}$	$ND_{0.5}$
	5.5 - 7	D5517	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	13	$ND_{1.0}$	$ND_{1.0}$
	7 - 8.5	D5493	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	7.0	$ND_{0.5}$	$ND_{0.5}$
	8.5 - 10	D5494	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	21	$ND_{2.5}$	$ND_{2.5}$
X	0.5 - 1.0	D5475	ND_{500}	ND_{500}	ND_{500}	ND_{500}	23,000	ND_{500}	ND_{500}
	1.0 - 2.5	D5476	ND_{50}	ND_{50}	ND_{50}	ND_{50}	1,300	ND_{50}	ND_{50}
	2.5 - 4.0	D5477	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	21	$ND_{1.0}$	$ND_{1.0}$
	4.0 - 5.5	D5478	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	54	$ND_{2.5}$	$ND_{2.5}$
	5.5 - 7.0	D5479	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	8.6	$ND_{1.0}$	$ND_{1.0}$
	7.0 - 8.5	D5499	ND_{5}	ND_{5}	ND_{5}	ND_{5}	18	ND_{5}	ND_{5}
	8.5 - 10.0	D5501	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	10	$ND_{0.5}$	$ND_{0.5}$
Y	1 - 2.5	D5481	ND_{500}	ND_{500}	ND_{500}	ND_{500}	11,000	ND_{500}	ND_{500}
	2.5 - 4.0	D5482	ND_{50}	ND_{50}	ND_{50}	ND_{50}	500	ND_{50}	ND_{50}
	4.0 - 5.5	D5483	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	30	$ND_{1.0}$	$ND_{1.0}$
	5.5 - 7.0	D5484	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	$ND_{0.5}$	11	$ND_{0.5}$	$ND_{0.5}$
	7.0 - 8.5	D5498	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	7.2	$ND_{1.0}$	$ND_{1.0}$
	8.5 - 10.0	D5499	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	7.0	$ND_{1.0}$	$ND_{1.0}$
Z	0.5 - 2.0	C5434	ND_{500}	ND_{500}	ND_{500}	ND_{500}	22,000	ND_{500}	ND_{500}
	2.0 - 3.5	C5435	ND_{500}	ND_{500}	ND_{500}	ND_{500}	7,300	ND_{500}	ND_{500}
	3.5 - 5.0	C5436	ND_{50}	ND_{50}	ND_{50}	ND_{50}	1,900	ND_{50}	ND_{50}
	5.0 - 6.5	C5437	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	87	$ND_{2.5}$	$ND_{2.5}$
	6.5 - 8.5	C5438	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	$ND_{2.5}$	28	$ND_{2.5}$	$ND_{2.5}$
	8.5 - 10.0	D5480	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	$ND_{1.0}$	35	$ND_{1.0}$	$ND_{1.0}$

(a) Concentration in mg/Kg dry weight basis.

(b) ND_{xx} means not detected at or above the concentration of xx.

its' cause were not known until after the April review of the groundwater results. At this point, it was not possible to correct the situation. Thus, it must be recognized that there are no valid results for phthalates in either the soil or groundwater samples.

2.2 Soil - Well Sites

At least three soil samples from each well site were analyzed. Soil from near the surface and at approximately 25 and 50 ft. depths were generally chosen as providing a vertical section of the sites. The list of parameters and the results are given in Table 2.2. Due to difficulties originating at the laboratory, ETC, sites C and E had to be sampled a second time to obtain soil for the Aroclor analyses. Thus, the results for the Aroclors at these sites were obtained using different samples from those used for the other parameters. Regarding the special soil and water samples taken at the 48 ft. depth at Site E (see 1.2), the water, the oily phase and some sediment were examined qualitatively with GC/MS to determine the major components. The results are given in a report located in Appendix B-3.

Aroclor 1248 at 400 ppm in soil and water mixture, also phthalates in the ppm range. (di-n-butyl 24 ppm, bis 2 ethyl...

2.3 Groundwater

Water samples collected from each well site at two depths were analyzed. The parameters and results are given in Table 2.3.

2.4 Soil - Therminol Spill Area

All of the soil samples from the therminol spill area were analyzed for the seven Aroclors listed by the USEPA as priority pollutants. A total of 26 samples from the four sites were analyzed. The results are listed in Table 2.4 along with the laboratory sample numbers for cross referencing.

3.0 Discussion of Results

3.1 Soil - Well Sites

Except for sites E and F the results on the soil samples indicate a very low level presence of two organic compounds, tetrachloroethylene (TECE) and Aroclor 1248 in isolated samples. Two phthalates were identified at site E, but no conclusions about the presence of phthalates can be reached relative to other sites. Other parameters were not detected at levels of note.

The TECE was detected in seven soil samples from four sites. Sites A and D had none at all. At sites B and C the top samples only had very low concentrations, less than 0.4 ppm. At site F the samples taken 20 and 30 feet below the sump bottom had 1.7 and 0.12 ppm respectively, while the samples near the sump bottom (F-17) and the samples taken from the rim of the sump had nothing. At site E samples taken at depths of 2, 6 and 25 feet had concentrations of 244, approximately 1 and 0.16 ppm respectively. These data indicate that the source of the TECE at Site E is near the surface and that the TECE from this source will not be found in significant quantitation below the 25 foot depth.

Traces of Aroclor 1248 (less than 1 ppm) were found in seven samples from three sites. Four of these were at site E with three of them being in samples where TECE also was found. Two more were in samples from site C and one at Site D. The levels are so low (two are near the

detection limit) that no significance can be given to the small differences in concentrations.

The qualitative analysis of the special samples taken from the 48' level of site E showed the presence of Aroclor 1248, bis(2-ethylhexyl)-phthalate and di-n-butylphthalate. These compounds were found in the mixtures of the oily phase with water and/or sediment, but not in the water phase. The fact that this oily phase was not observed in the resampling for Aroclors analysis indicates that this area contains a boundary zone for a localized source or a plume of unknown origin.

3.2 Groundwater

Low concentrations of four chlorinated organic compounds were found in water from sites A-2, C-2, D-1, E-1, F-1 and F-2. The trichloroethylene (TCE) value for A-2 (25 ppb) and the TECE for C-2 (50 ppb) are low and seem to originate from upgradient (off-site) source. The TECE data for the groundwater do not correlate with the TECE found in the soils. The pattern of 1,2-transdichloroethylene and vinyl chloride seen in E-1, F-1 and F-2 is consistent with the hypothesis that TCE or TECE can biodegrade to yield these compounds.[2,3,4]

The relatively high values (compared to other sites) of TOC and COD for sites C-1, D-1, E-1, E-2, F-1 and F-2 indicate the presence of some organic compounds and/or oxidizable substances. The presence of extra peaks in the volatiles and base neutral chromatograms for samples from sites E-1, F-1 and F-2 tend to reinforce the idea that other unidentified materials are present at these sites.

Values for groundwater parameters, other than those mentioned above, are not considered to be notable. The values for zinc reported in A-1 and E-1 are doubtful since they are not much above the detection limit and a similar value was reported for one of the blank samples. The value for specific conductance for the blank water is very likely to be an error of decimal location.

3.3 Soil - Therminol Spill Area

Aroclor 1248 was the only Aroclor found in these soil samples. Concentrations were highest at the surface and decreased rapidly with increasing depths. For sites W, X, and Y, a relatively constant value of less than 50 mg/Kg was reached at depths between 2.5 and 4 ft. At site Z this constant value was reached at between 6.5 and 8.5 ft. These constant values may result from small amounts of soil from the top being moved to lower depths by the drilling-sampling procedures.

4.0 ANALYTICAL QUALITY ASSURANCE

4.1 Summary

Reviews of the Hicksville Analytical Program were made February 24th and April 12, 1984 at ETC Laboratories, N.J. In general, all analyses have been performed according to the requirements of the study as described in the document "Proposed Hicksville Plant Groundwater Study", D. R. Thielen and R. G. Badger, March 3, 1983.

Documentation is complete for all phases of the quality assurance program including chain of custody, analytical methodology, calibration and quality control (spikes and duplicates).

Quality control data indicates that no major problems existed in the analytical program, except for the analysis of phthalates where the EPA procedure proved inadequate. The performance of the laboratory was acceptable.

4.2 Introduction

The analytical requirements of the Hicksville Groundwater Study are contained in the document "Proposed Hicksville Plant Groundwater Study", D. R. Thielen and R. G. Badger, March 3, 1983.

The analytical services required by the study were provided by Environmental Testing and Certification Corporation (ETC), 284 Raintan Center Parkway, Edison, NJ.

All groundwater and soil samples submitted were analyzed according to

the study requirements for all parameters.

4.3 Specific Points

4.3.1 Phthalates

USEPA Method 625 was selected for the analysis of phthalates, either directly in groundwater or from water generated by the EP TOX leach test. This GC/MS method is a general method to analyze a number of classes of compounds including phthalates. Detection limits for some of phthalates were not reported by the laboratory because acceptable spike recoveries (>50%) were not obtained. The reason given was that the method calls for a pH of greater than 11, at this pH, phthalates hydrolyze and can not be recovered. This is an inadequacy of the method rather than of the laboratory. Neither the laboratory nor Occidental were aware of this problem prior to beginning the study.

4.3.2 Holding Times

In some instances the 7 day holding period prior to extraction of samples for Method 625 was not met. They were extracted within 22 days of receipt. The laboratory feels, based on private communications from researchers at Rutgers University, that this would not affect the validity of the analyses. We agree with the laboratory that the longer holding time should not affect the analysis.

4.3.3 Quality Control

Excellent documentation of internal quality control

procedures was received. This included chain of custody, method summary and GC/MS performance data for every sample. Calibration curves were shown to be linear. Analyses were repeated when a blank sample was shown to be contaminated. The method detection limits were calculated based on the lowest standard run.

4.3.4 Precision and Accuracy

Precision and Accuracy data for all compounds over the course of the study have been compiled: Table I, Soil/Leachate Data; Table II, Water Data. The first two columns of the tables shown accuracy and precision for a spike into a reagent water blank. The accuracy is the average recovery observed for each compound/ parameter. The precision is the % relative standard deviation of all the recoveries performed. The third and fourth columns show accuracy and precision for a matrix (actual sample) spike. Spiking level and method detection limit are shown in columns five and six.

The tables show that accuracy and precision were similar for the blank and matrix spikes. The matrix spike was slightly less accurate and precise, as would be expected. In general, the precision and accuracy data were acceptable for all parameters. The only exception was vinyl chloride in soil where

[redacted] precision is 42%. The loss of very volatile compounds is to be expected during handling of soil samples. Recoveries of Butylbenzyl, Diethyl, Dimethyl and Di-n-butyl phthalates were very poor, this was discussed earlier. Matrix spike recoveries for Moca were low, but are considered acceptable.

TABLE I

Soil/Leachate

Compound	Spike Blank Accuracy	Spike Blank Precision	Spike Sample Accuracy	Spike Sample Precision	Spiking Level	MDL
PCB						
A1248	-	-	93	39	0.2	0.1 mg/kg
A1248	-	-	117	14	15-17	0.1 mg/kg
Phthalates						
Bis 2 ethylhexyl	107	13	70	18	300	100 ug/kg
Butyl Benzyl	13	5	13	5	300	100 ug/kg
Diethyl	3	1	5	4	300	100 ug/kg
Dimethyl	1	1	1	1	300	100 ug/kg
Di-n-butyl	23	8	25	13	300	100 ug/kg
Di-n-octyl	97	16	30	8	300	100 ug/kg
Moca	97	16	30	8	500	250 ug/kg
Volatiles						
1,1-Dichloroethylene	95	12	98	13	36	10 ug/kg
Tetrachloroethylene	103	8.5	95	12	36	10 ug/kg
Toluene	98	5.6	99	6.2	36	10 ug/kg
1,2-Trans-dichloroethylene	95	11	92	4.7	36	10 ug/kg
Trichloroethylene	101	5.3	97	15	36	10 ug/kg
Vinyl Chloride	94	18	67	42	36	5 ug/kg
Styrene	105	8.5	107	15	36	10 ug/kg
Metals, Conventionals						
Barium	101	2.4	100	4.9	4.0	1.0 mg/l
Cadmium	99	2.9	95	9.2	0.400	0.050 mg/l
Copper	101	5.4	92	8.3	0.400	0.200 mg/l
Lead	101	3.5	100	4.0	1.6	0.01 mg/l
Zinc	102	2.7	93	6.2	1.6	0.050 mg/l
Mercury	99	3.6	96	10	0.002	0.0003 mg/l
Nitrate	95	8.4	94	9.2	0.5-10	0.10 mg/l
Sulfate	99	2.2	103	3.9	25	9 mg/l
Phenols, Total	103	6.7	98	3.3	0.100	0.050 mg/l
COD	102	8.4	95	11	500	2 mg/l
TOC	-	-	-	-	-	-
TOC	-	-	-	-	-	-
TOC	-	-	-	-	-	-

TABLE II

Water

Compound	Spike Blank Accuracy	Spike Blank Precision	Spike Sample Accuracy	Spike Sample Precision	Spiking Level	MDL
PCB						
A1248	73	7.6	72	13	20	10 ug/l
Phthalates						
Bis 2 ethylhexyl	83	13	69	5	30	10 ug/l
Butyl Benzyl	15	5	17	3	30	10 ug/l
Diethyl	3	2	4	3	30	10 ug/l
Dimethyl	2	2	2	2	30	10 ug/l
Di-n-butyl	20	5	23	1	10	10 ug/l
Di-n-octyl	71	14	57	9	30	10 ug/l
Moca	63	15	47	7	60	25 ug/l
Volatiles						
1,1-Dichloroethylene	122	13	109	7.3	14	10 ug/l
Tetrachloroethylene	97	15	110	7.4	14	10 ug/l
Toluene	103	12	112	16	14	10 ug/l
1,2-Trans-dichloroethylene	120	4.9	120	3.7	14	10 ug/l
Trichloroethylene	99	16	100	13	14	10 ug/l
Vinyl Chloride	92	18	97	13	14	5 ug/l
Styrene	100	4	105	5.6	14	10 ug/l
Metals, Conventionals						
Barium	102	31	107	14	2.0	1.0 mg/l
Cadmium	112	1.1	111	1.6	0.120	0.050 mg/l
Copper	107	6.4	108	2.3	0.400	0.200 mg/l
Lead	118	1.6	102	2.1	0.02	0.10 mg/l
Zinc	103	3.7	112	2.2	0.120	0.050 mg/l
Mercury	103	0.1	96	0.1	0.0005	0.0003 mg/l
Nitrate	95	8.4	94	9.2	0.5-10	0.10 mg/l
Sulfate	99	2.2	103	3.9	25	2 mg/l
Phenols, Total	103	6.7	98	3.3	0.100	0.050 mg/l
COD	102	8.4	95	11	500	2 mg/l
TOC	-	-	125	0.1	2	1 mg/l
TOC	-	-	95	4.7	44	1 mg/l
TOC	-	-	108	0.4	19	1 mg/l

APPENDIX B-1

PROPOSED HICKSVILLE PLANT GROUNDWATER STUDY

PROPOSED HICKSVILLE PLANT GROUNDWATER STUDY

A study of the groundwater and certain soils at the Occidental Chemical Corporation's former Hicksville plant (Hicksville, Long Island, New York) is being planned. The work will be divided into two tasks, sampling and analytical. The requirements for both of these tasks are outlined in this document to aid in the estimation of the cost of the program.

I. SAMPLING

Sampling will be performed by a two-person team with experience in environmental sampling. The senior member of the team will be responsible for complete documentation of sampling which will be kept in a field notebook with bound pages, appropriately dated and signed. The sampling team will be responsible for supplying proper sample containers, the filtration of water samples, for the preservation of all samples and performing any tests required in the field. The team also will maintain chain of custody records for all samples until they are shipped to the analytical laboratory.

Twelve (12) well sites will be sampled for water and samples of soil will be taken during the construction of six (6) of these wells. Six (6) of these wells will be screened at the 50-70 ft. depth and six (6) will be screened at the 80-100 ft. depth. Additional soil samples will be taken at 4 to 7 other sites during the same time that the wells are being constructed.

Groundwater Details

Wells will be sampled after pumping at least four volumes of the well casing, or until the well has been completely evacuated, whichever comes first. Placement of the pump inlet tubing should be such as to assure that the water in the casing will be exchanged with fresh water from the aquifier. Pumping and sampling will be performed using a peristaltic, centrifugal or gas lift pump which contain materials of construction shown not to compromise or contaminate the sample in any way. Samples for volatile organics will be taken by bailing after the well has been purged. With the exception of the Group A compounds, all water will be pressure filtered using a 0.5u pore size "Teflon" membrane filter and placed into an appropriate sample container. Group A compounds will be taken and analyzed as unfiltered samples (after any solids have separated by settling or mild centrifugation). The sample must be properly preserved as noted in Table I and stored at 4^{o} C until analysis.

Detailed preservation techniques are noted in reference (1). Conductivity and pH measurements will be made on unfiltered samples in the field.

Soil Details

Soil samples at well sites will be taken during well construction at approximately five (5) foot intervals in the unsaturated zone. A 2"x24" split spoon driven in advance of the auger will be the mode of sampling. The top six (6) inches of the split spoon sample will be discarded in all cases and the remainder will be placed in a suitable size glass jar with a "Teflon" lined screw cap. All soil samples will be cooled to 4°C for transportation to the laboratory. It is expected that separate samples (using special precautions to avoid loss of volatiles) will be taken for volatiles analysis.

Soil samples in the Therminol handling area will be taken by continuous split spoon sampling to a depth of approximately 6 feet. The initial sampling will be at the center of the handling area and 10 feet from the center in three radial directions. If contamination is found in the initial samples, additional sampling will be required to define the area of contamination.

Sampling Cleanup

Cross contamination between sites for either water or soil sampling must be avoided. This can be done either by dedicated pumping equipment for water or by rigorous clean up between sites (for water) or samples (for soil). Details on the procedures to protect sample integrity should be provided.

II. METHODOLOGY

Table 2 contains the groupings of those compounds which must be determined in the samples. The required detection limits are also included.

Groundwater

VOA Group A. EPA Method 624 is required using GC/MS for quantitation. Styrene has been included as per the attached memo (Simon, N., September 29, 1982).

phthalates base neutrals Group B. EPA Method 625 is required using GC/MS for quantitation. MOCA has been included as per the attached memo (Simon, N., September 29, 1982).

PCB's Arochlor Group C. EPA Method 608 is required using GC/EC for quantitation.

Nitrates Sulfates metals Group D. The required EPA Methods are listed in Table II.

Soil

VOA Group A. The required method is a modification of a Midwest Research Report (5). The specific modifications of this method are found in the attached report (Simon and Johnson, August 16, 1982). Quantitation will be by GC/MS.

Base neutral phthalates Group B. The soil will be prepared by obtaining an aqueous extract of the soil using the EPA's EP Toxicity digestion procedure 2. The aqueous extract will be analyzed using EPA Method 625 and GC/MS for quantitation. The limits of detection stated in Table II are based on the limits for the aqueous extract using Method 625 and related back to the original soil sample.

Arochlor Group C. The required method is that described in Reference (3). In cases of interferences from organochlorine pesticides, an additional clean-up procedure, as outlined in Section 9C of the same manual, will be considered. Quantitation will be by GC/EC. NOTE: Due to the nature of the program, special priority should be given these samples to obtain the most rapid turnaround possible. Please state what this will be.

Nitrates Metals Sulfates Group D. The required EPA procedures listed in Table II will be carried out on an aqueous extract of the soil obtained by using the EP Toxicity digestion procedure (2). The parameters of pH, conductivity COD and TOC will not be required for soils.

The USEPA Methods defined above may be modified in your proposal if valid technical reasons exist. In all cases, your proposed methodology must attain the expected detection limits and be fully documented. Full verification of any non-EPA methods must be made.

III. QUALITY ASSURANCE

As a general rule, EPA practices outlined in Reference (4) will be followed. In particular, the following QC procedures will be required for every batch of samples or at a minimum of every ten samples:

(1). Replicate sample analysis as randomly selected by the contractor with approval of the project liaison.

(2). Recovery of all analyzed compounds at two to three times the detection limit using laboratory distilled water.

(3). Recovery of spikes made to a sample selected by the contractor with approval of the technical liasion. Spiking will be done for all analyzed compounds at a level which approximately doubles the concentration found in the sample. In samples where compounds of interest are not detected, spiking must be at levels not exceeding two to three times the detection limit.

(4). Reagent and method blanks.

All standards used for quantitation must be traceable to a verified standard; that is, a compound whose purity has been determined by at least two different analytical procedures. A linearity of detector response for each compound must be demonstrated by generation of a linearity curve containing five concentrations of that compound. All sample calculations must be made from responses which fall within this linear range. During the course of the analysis, standards must be interspersed at frequent intervals to check the calibration. The preparation of all standards including purity verification, dilutions, linearities, etc. must be recorded in the bound notebook.

Samples and extracts must be retained and properly stored until time of disposal. After acceptance of the final report by Occidental, the contractor must request and receive permission prior to disposing of samples.

Records containing all relevant data must be easily accessible and kept for a specified period of time as determined by Occidental's technical liaison. These records must include all logbooks, workbooks, worksheets, graphs, charts and/or any records of pertinent nature relating to this study.

All chromatography scans must remain connected in the sequence in which they were generated, i.e., no scans shall be cut, torn or otherwise removed from the body of the chromatographic data attached to it.

The final report must include sample identification information, methods used, analysts, and all samples and quality control data. The calculated data must include units of concentration and limits of detection given with the proper significant figures. In cases where compounds are not detected at or above the stated detection limit, the reporting protocol will be ND_x where x is the required detection limit. An assessment of analytical precision and accuracy must also be stated.

The contractor will designate a project manager who has direct responsibility for the technical aspects of the study. The project manager will be available for detailed technical reviews during the course of the program.

III. QUOTATION AND TECHNICAL PROPOSAL

One technical proposal should cover the complete sample program outlined above. It should contain the following:

(1). Documented methodology for each analysis.

(2). Detailed procedures for and the cost of sampling. Also, the precise number, size and type of samples required from each sampling point to allow the contractor to do all the analyses which may be necessary i.e. spikes, duplicates, etc.

(3). Timing for completion of analyses after receipt of samples. To include issuing of preliminary (verbal) and final (draft) reports.

(4). A separate cost estimate broken down by analysis and sample including necessary development work.

(5). An estimate of timing starting from receipt of samples to when a report including documentation, QA/QC and results can be expected.

One quotation should be submitted separately and cover the complete program. Included in the quotation should be the cost broken down by analysis and sample.

The technical proposal and quotation should be sent to our attorney, who will also refer any questions to the appropriate technical personnel.

John Hanna, Esq.
WHITEMAN, OSTERMAN AND HANNA
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DATE:_____

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_____

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/jb
03/02/83

REFERENCES

(1). "Handbook for Sampling and Sample Preparation of Water and Wastewater", EPA-600/4-82-029, Sept. 1982.

(2). "RCRA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", SW-846, May 1980.

(3). "Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA-600/8-30-038, June 1980, Section 11A.

(4). "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979.

(5). MRI Special Report No. 1, "Development of Analytical Test Procedures for the Measurement of Organic Priority Pollutants in Sludges and Sediments", June 26, 1979, Midwest REsearch Institute Project No. 4583-A.

TABLE 1
PRESERVATION METHODS - WATER

PARAMETER	PRESERVATION METHOD
VOLATILE ORGANICS	4°C
BASE/NEUTRAL ORGANICS	4°C
PCB'S	4°C
NITRATES	2ML H_2SO_4 PER LITER AND 4°C
SULFATES	4°C
CADMIUM*	ADD 1:1 REDISTILLED HNO_3 TO PH OF <2
MERCURY*	"
BARIUM*	"
COPPER*	"
LEAD*	"
ZINC*	"
COD	ADD SULFURIC ACID TO PH OF <2 AND 4°C
TOC	ADD H_2SO_4 OR HCL TO PH OF <2 AND 4°C
PHENOLICS	ADD H_3PO_4 TO PH OF <4, ADD 1G/L OF $CUSO_4$, AND 4°C

GROUP A

VOLATILES FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
TETRACHLOROETHYLENE	10	100
TRICHLOROETHYLENE	10	100
DICHLOROETHYLENE	10	100
TOLUENE	10	100
VINYL CHLORIDE	5	100
STYRENE	10	100

GROUP B

BASE NEUTRAL FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
BIS(2-ETHYLHEXYL)PHTHALATE	10	100
BUTYL BENZYL PHTHALATE	10	100
DIETHYL PHTHALATE	10	100
DIMETHYL PHTHALATE	10	100
DI-N-BUTYL PHTHALATE	10	100
DI-N-OCTYL PHTHALATE	10	100
MOCA (3,3'-DICHLORO-4,4'-DIAMINODIPHENYLMETHANE)	25	250

GROUP C

AROCHLOR FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
AROCHLOR-1016	10	100
AROCHLOR-1221	10	100
AROCHLOR-1232	10	100
AROCHLOR-1242	10	100
AROCHLOR-1248	10	100
AROCHLOR-1254	10	100
AROCHLOR-1260	10	100

GROUP D

OTHER PARAMETERS	WATER AND SOIL OPTIMUM RANGE	USEPA METHOD #
NITRATES	0.1 TO 2.0MG NO -N/LITER	352.1
SULFATES	3 TO 400 MG SO /LITER	375
CADMIUM*	0.05 TO 2 MG/LITER	213.1
MERCURY*	>0.2 UG/LITER	245.1
BARIUM*	1 TO 20 MG/LITER	208.1
COPPER*	0.2 TO 5 MG/LITER	220.1
LEAD*	5 TO 100 UG/LITER	239.2
ZINC*	0.05 TO 1 MG/LITER	289.1
CONDUCTIVITY	--	120.1
PH	--	150.1
COD	20 TO 900 MG/LITER	410.4
TOC	>1 MG/LITER	415.1
PHENOLICS	>5 UG/LITER	420

* - THE DETECTION LIMIT IS BASED ON THE ANALYSIS OF AN AQUEOUS EXTRACT AND RELATED BACK TO THE ORIGINAL WEIGHT OF THE SOIL.

** - THE DETECTION LIMIT IS BASED ON THE ANALYSIS OF THE WATER OBTAINED FROM THE AQUEOUS EXTRACTION OF THE SOIL(EP TOX).

Occidental Chemical Corporation
Research Center

MEMO

To A. F. Weston **Date** September 29, 1982

From N. Simon

Subject GC/MS Analysis of Styrene, Moca, Phthalates and Five Volatile Organics

COPIES: D. Johnson, P. Skotnicki, R. Badger, TIC

I. SUMMARY

The EPA Priority Pollutant Method for base neutral organics was extended to include styrene and 3',3'-dichloro 4,4'-diamino diphenyl methane (MOCA). Standard curves were generated and extraction efficiencies calculated. Detection limits were set at 10 µg/L for styrene and 25 µg/L moca. The volatiles analyses could also be used to analyze for styrene and appears to be the preferred method.

A. Extractables

1). Instrumental Parameters

Gas Chromatographic Conditions (Finnigan 96100)

Column		- 15 m DB5-NB fused silica capillary (J&W)
Carrier		- Helium 15.0 psi
Injector Temperature		- 275°C
Injection		- Grob, 60/1 split after 60 seconds
Detector Temperature		- 275°C
GC/MS Interface		- 265°-275°C
Column Program	1)	- 20° to 250° at 10°/minute after a 1 minute hold at 20°, hold at 250° for 20 minutes.
	2)	- Without styrene - 50° to 250°.

Mass Spectrometer Conditions (Finnigan 4000)

Instrument	- Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	- 85°, Electron Impact Source with 70eV ionizing electrons
EM Volts	- 1380 volts
Scan Parameters	- Total scan sequence - .5 second consisting of acquisition during .45 second up scan, .05 second hold at bottom. Mass range scanned 350-45.

2). Sample Preparation

for the base neutral extraction, one liter of sample was adjusted to pH 11 with 6N NaOH; extracted three times with methylene chloride according to EPA protocol; dried through a sodium sulfate column; and concentrated to 5 ml using a Kuderna-Danish evaporator and nitrogen.

An internal standard, deuterated phenanthrene was added 15 minutes prior to the analysis.

3). Standard Preparation

A stock solution containing the six phthalates was purchased from Supelco. Styrene and MOCA standards were prepared in-house. The standards were prepared to give 1,5,10 and 20 times the detection limit. The detection limit for MOCA was set at 25 µg/L to give a relatively equivalent response when compared to styrene and the phthalates at 10 µg/L.

4). Extraction Efficiencies

Since the method has routinely been used for phthalates it was only necessary to verify its efficiency for styrene and MOCA. Three blank water samples were spiked at 10X the detection limit, extracted and analyzed by the method noted above.

	% Recovery			
	Styrene		MOCA	
Sample	Day 1	Day 2	Day 1	Day 2
20832	51	55	72	88
20833	74	60	79	85
20834	88	74	69	83

The ions used to identify and quantitate were m/e 266, 268, and 131 for MOCA, and m/e 104, 102, 51 for styrene.

(B). VOLATILES

Extending Method 624 to include styrene.

(see Page 3 for Volatiles)

(B). VOLATILES

1) Instrumental Parameters

Purge and Trap Conditions
(Tekmar Liquid Sample Concentrator-Model LSC-2)

Plumbing	- Hard plumbed from trap effluent to the GC flow controller via a 1/8 inch O.D. copper line
Trap Column	- 12" x 1/4" stainless steel tubing packed with Tenax 60/80 mesh. Baked after each run at 250° for 20+ min.
Purge	- 12 minutes at 30 cc/minute
Desorb	- 4 minutes at 195°C
Sample Size	- 5 ml transferred by Blenco gas/liquid syringe

Gas Chromatographic Conditions (Finnigan 9610)

Column	- 8 foot by 1/4 inch (2mm I.D.) glass packed with 0.1% SP-1000 on Carbopack C
Carrier	- Helium at 30 cc/minute
Injector	- 180°C
GC/MS Interface	- 250°
Column Program	- 50° for purge, desorb and three minutes after desorb, 8°/min. to 180°; held for 30 min. at 180°

Mass Spectrometer Conditions

Instrument	- Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	- 260°, Electron Impact Source with 70 eV ionizing electrons
Manifold Temperature	- 90°
Electron Multiplier	- 1080 volts
Scan Parameters	- Total scan sequence of 2 seconds consisting of data acquisition during 1.95 sec. up scan, 0.05 sec. hold at bottom. Mass range scanned 45-270.

2. Standards

The standards used were supplied by Supelco and are described as "Standards for EPA Consent Decree Protocol". They are further referenced to (I.F.B. No. WA77-B133, Appendix B, Sampling and Analysis for Priority Pollutants, US EPA). A solution of styrene at the same concentration as the above standards, was prepared in the lab.

Bromochloromethane, 2-Bromo-1-chloropropene and 1,4-dichlorobutane were used as internal standards.

The stock solutions, as received from Supelco, were stored in a freezer. Dilutions were stored in the refrigerator in 15 ml hypovials until one hour before analysis. Standards were prepared to give concentration levels of 10 µg/L (50 ng injected) and 100 µg/L (500 ng injected). An additional standard at 25 µg/L (125 ng injected) was analyzed to verify linearity. Internal standards were prepared at 20 µg/L; 5 µl (100 ng injected) was used to spike each standard and sample.

Standards were stored in the refrigerator until one hour before analysis.

Standards were poured into a 5 ml syringe; the volume adjusted; the needle removed and 5 µl internal standard added immediately before injection into the Tekmar.

Standards could be prepared by weighing pure materials into methanol instead of using the commercial mix since only five of the priority pollutants are required: perchloroethylene, trichloroethylene, trans-1,2-dichloroethylene, toluene, and vinyl chloride. It should also be noted that the required detection limit for VCM is 5 µg/L while the detection limit for the other volatile components is 10 µg/L.

3. Results and Discussion

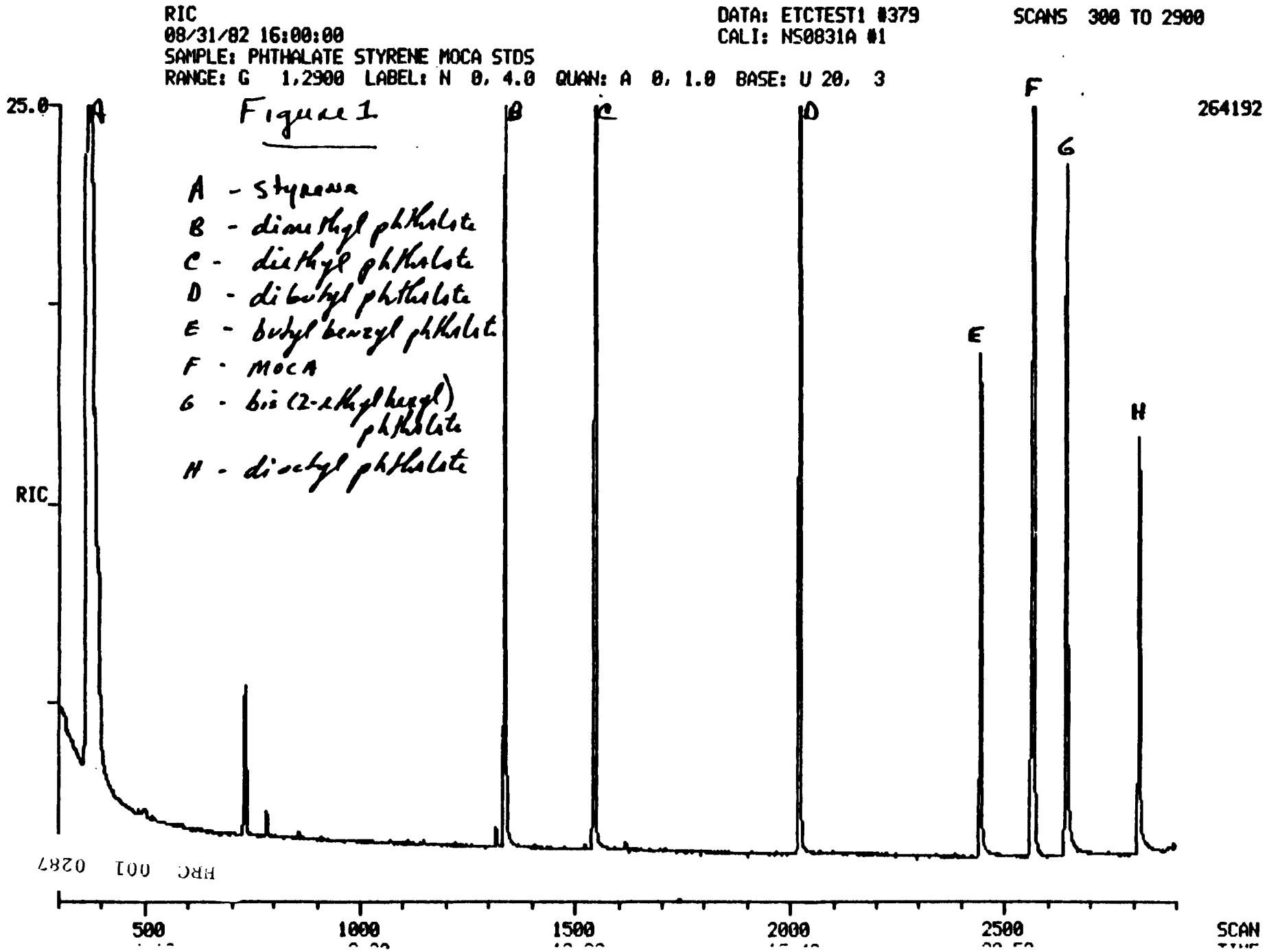
The EPA Priority Pollutant base neutral method can be extended to include styrene and MOCA. The chromatogram following (Figure 1) demonstrates the relative retention times of styrene and MOCA compared to the phthalates.

It seems preferable to analyze styrene with the volatiles rather than the extractables for a number of reasons: The gas chromatographic oven will not need subambient conditions to separate styrene from the solvent (see Figure 2); loss of styrene will not be a problem; a narrower range of internal standards will be acceptable, styrene carryover will be limited in the volatiles analysis, etc.

The RIC's from the analyses (Figures 1,2,4) and the mass spectrum of MOCA (Figure 3) follow.

Nan Simon
Central Sciences

jmw/


RIC
08/31/82 16:00:00
SAMPLE: PHTHALATE STYRENE MOCA STDS
RANGE: G 1,2900 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3
DATA: ETCTEST1 #379
CALI: NS0831A #1
SCANS 300 TO 2900
Figure 1
A - Styrene
B - dimethyl phthalate
C - diethyl phthalate
D - dibutyl phthalate
E - butyl benzyl phthalate
F - MOCA
G - bis(2-ethylhexyl) phthalate
H - dioctyl phthalate
25.0
264192
RIC
A
B
C
D
E
F
G
H
500
1000
1500
2000
2500
SCAN

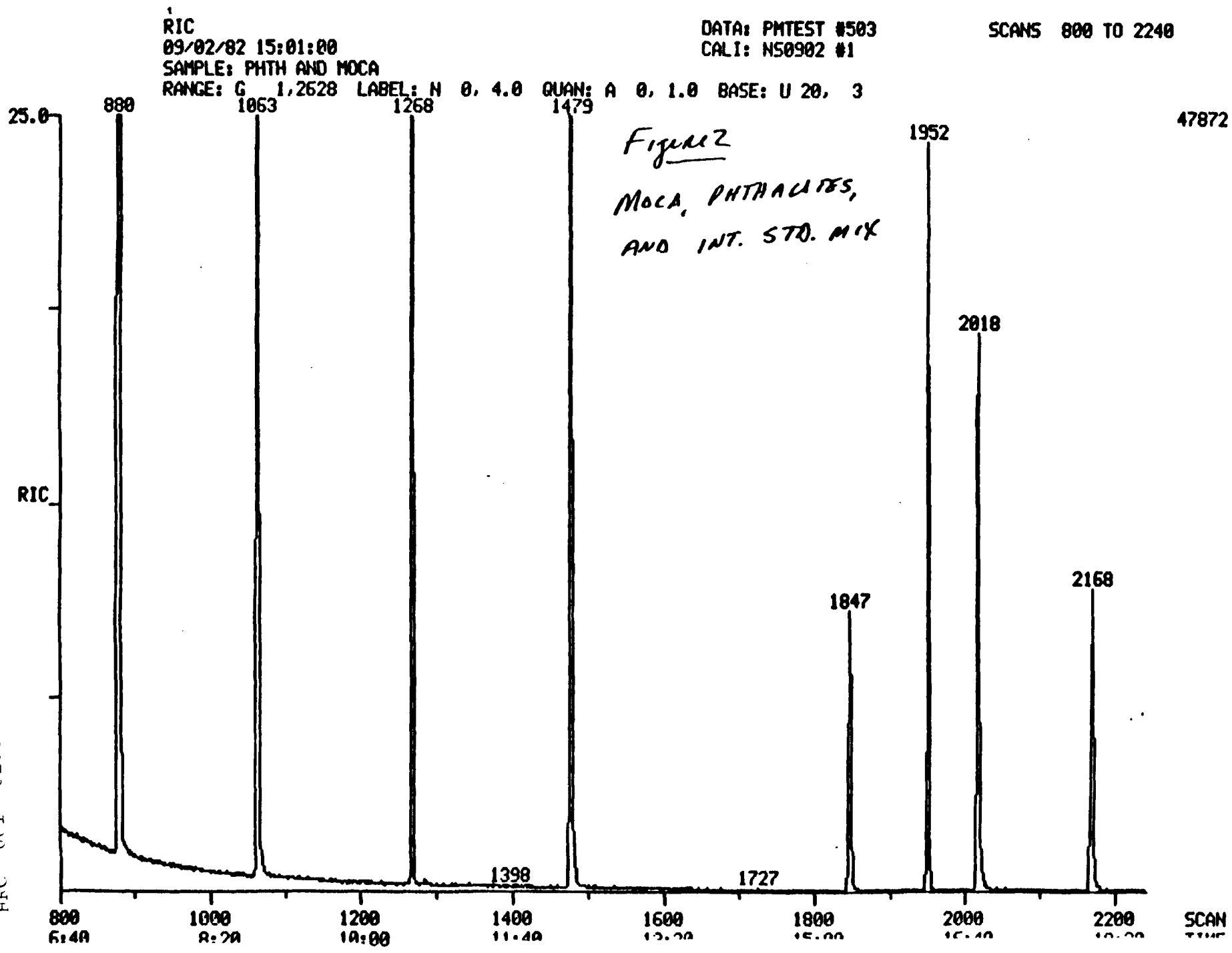
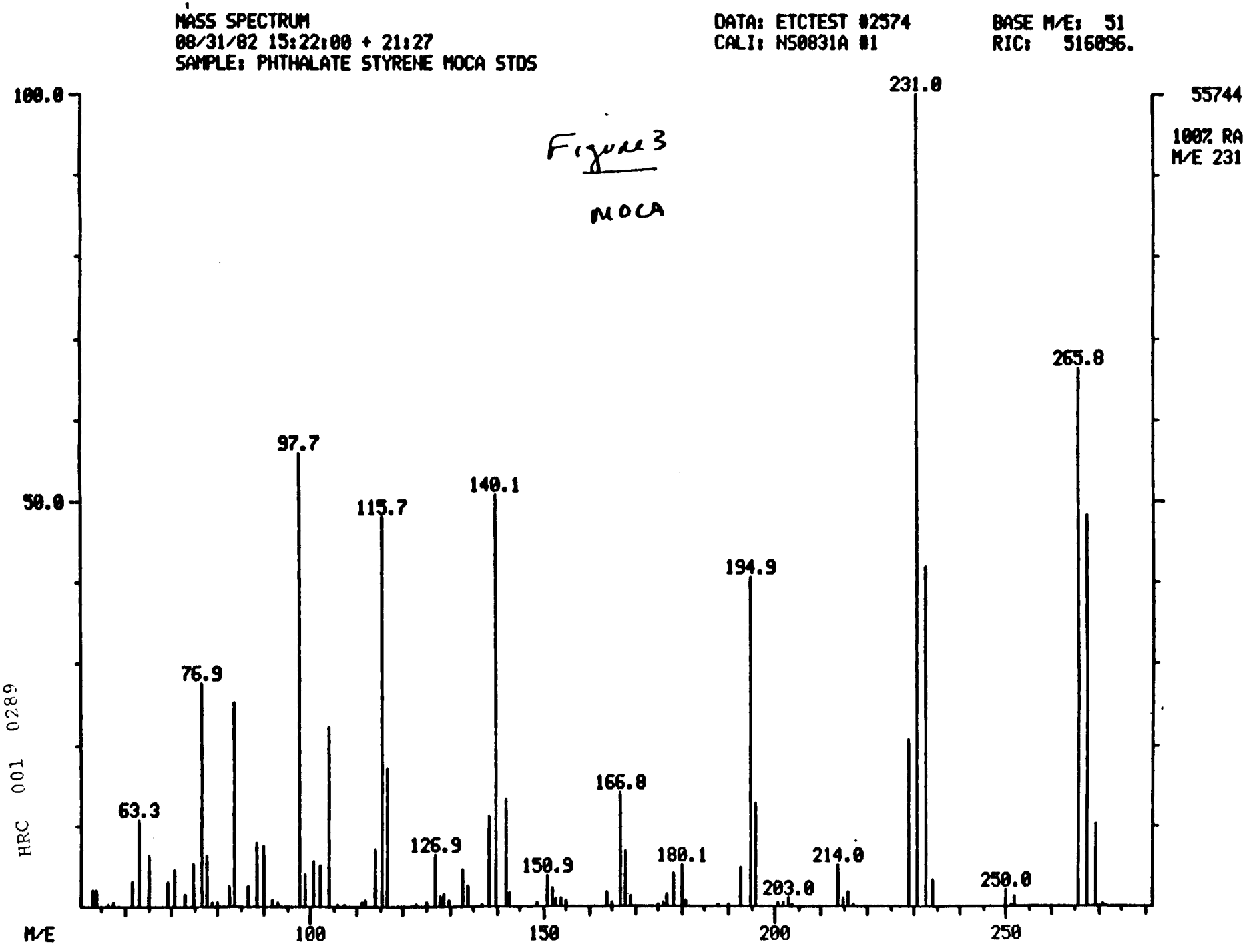
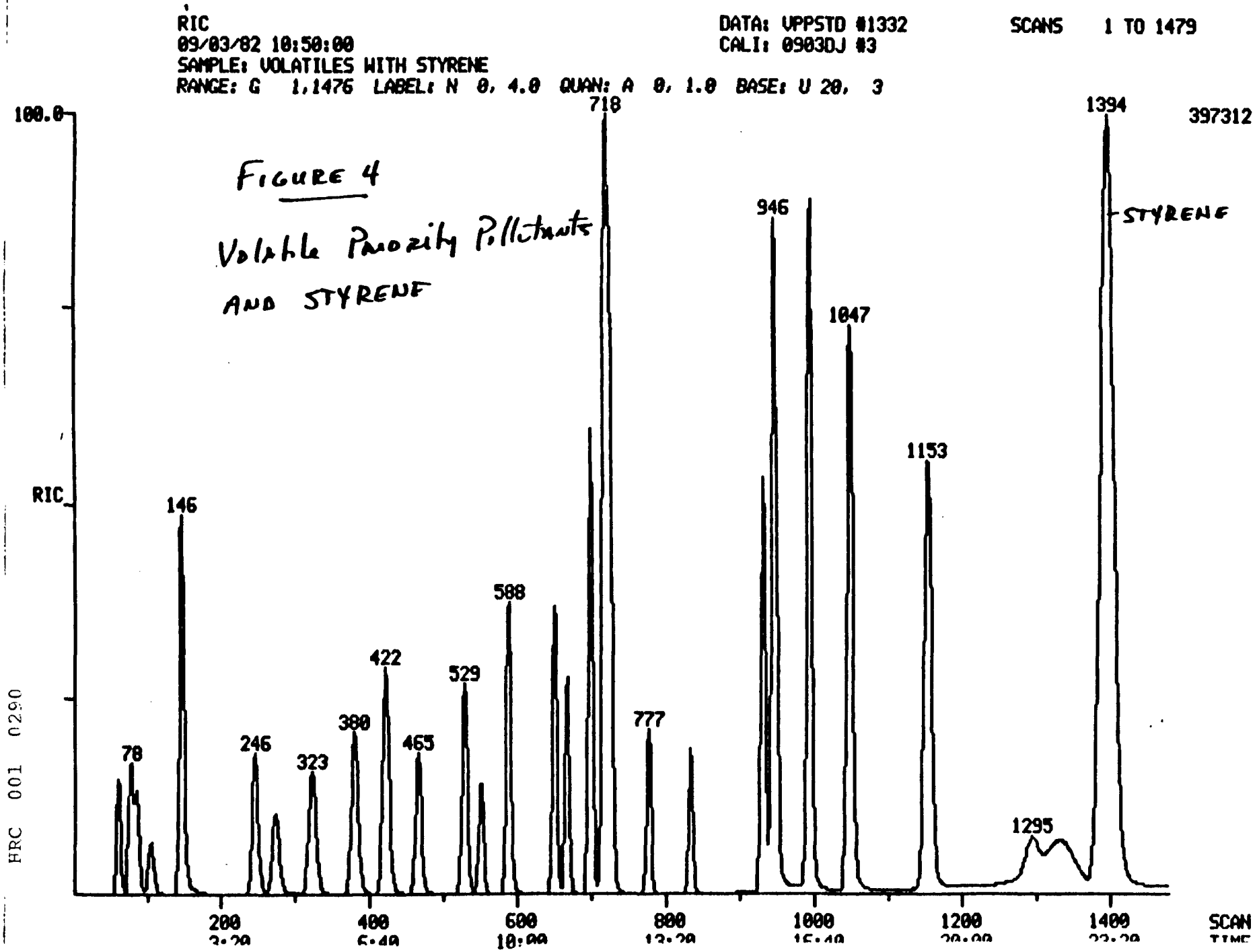


Figure 2

MOCA, PHTHALATES, AND INT. STD. MIX


MASS SPECTRUM
08/31/02 15:22:00 + 21:27
SAMPLE: PHTHALATE STYRENE MOCA STDS
DATA: ETCTEST #2574
CALI: N50831A #1
BASE M/E: 51
RIC: 516096.
55744
100% RA
M/E 231
Figure 3
MOCA
100.0
50.0
231.0
265.0
97.7
140.1
115.7
194.9
76.9
63.3
166.8
126.9
150.9
180.1
214.0
203.0
250.0
M/E
100
150
200
250
HRC 001 0289


RIC
09/03/82 10:50:00
SAMPLE: VOLATILES WITH STYRENE
RANGE: G 1.1476 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3
DATA: UPPSTD #1332
CALI: 0903DJ #3
SCANS 1 TO 1479
100.0
RIC
397312
FIGURE 4
Volatile Priority Pollutants
AND STYRENE
718
1394
946
STYRENE
1047
1153
146
588
422
529
380
777
246
323
465
78
1295
200
400
600
800
1000
1200
1400
SCAN
HRC 001 0290

hooker

August 16, 1982

To: R. Hall

From: N. Simon, D. Johnson

Distribution: P. Skotnicki, A. Weston

Reference: GC/MS Analysis of Soil Samples for Volatile Priority Pollutants

I. Summary

This report summarizes the GC/MS sample preparation and analyses of six soil samples taken at the Arecibo facility on 8/ /82. The methodology used was as developed for the EPA. It is considered semi-quantitative because of variances in the sampling, sample handling and the sample matrix.

Sample 00003 (STP Plant across from PRC/sewer bottoms in sewer dumping spot #5) was the only sample where priority pollutant volatile organics were detected at greater than 10 ug/L. The compounds found were benzene, toluene and chlorobenzene. Vinyl chloride, 1,1-dichloroethylene, trans-1,2-dichloroethylene and trichloroethylene were not detected in any of the samples. Toluene was only detected in 00003. Non-volatile priority pollutants found were xylenes in sample 00003 and dichlorobenzene in 00092.

II. Experimental

The EPA priority pollutant method is described in Special Report No. 1 "Development of Analytical Test Procedures for the Measurement of Organic Priority Pollutants in Sludges and Sediment", published June 26, 1979 under contract No. 58-03-2695, MRI Project No. 4583-A. The only significant deviation from the published method was the use of a larger sample to give a lower detection limit.

A. Instrumental Parameters

Purge and Trap Conditions
(Tekmar Liquid Sample Concentrator-Model LSC-2)

Plumbing	-	Hard plumbed from trap effluent to the GC flow controller via a 1/8 inch O.D. copper line.
Trap Column	-	12" X 1/4" stainless steel tubing packed with Tenax 60/80 mesh. Baked after each run at 250° for 20+ min.
Purge	-	12 minutes at 30 cc/minute
Desorb	-	4 minutes at 195°C
Sample Size	-	0.5g in 5ml distilled water

Gas Chromatographic Conditions (Finnigan 9610)

Column	-	8 foot by 1/4 inch (2 mm I.D.) glass packed with 60/80 Carbopack C/0.2% CW 1500
Carrier	-	Helium at 25 cc/minute
Injector	-	180°C
GC/MS Interface	-	250°
Column Program	-	50° for purge, desorb and three minutes after desorb; 8°/min. to 180°; held for 30 min. at 180°

Mass Spectrometer Conditions

Instrument	-	Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	-	260°, Electron Impact Source with 70 eV ionizing electrons
Manifold Temperature	-	90°
Electron Multiplier	-	1330
Scan Parameters	-	Total scan sequence of 1 second consisting of data acquisition during 0.95 sec. up scan, 0.05 sec. hold at bottom. Mass range scanned 45-180

B. Sample Preparation

The sample for each site was received in a wide mouth glass quart bottle with a teflon cover. (There was considerable head space in each bottle). One half ml. (∿ 0.5g) was transferred, using a tipless disposable pipet, to a Tekmar tube. Five mls of distilled water and 5 ml of an internal standard solution were added. The tube was immediately attached to the Tekmar and purged.

Since the samples did not appear to be homogenous and since there was one to three inches of headspace, the 0.5ml aliquot was taken from the bottom half of the bottle and each sample was analyzed in duplicate.

The samples were refrigerated until one hour before analysis.

C. Standards

The standards used were supplied by Supelco and are described as "Standards for EPA Consent Decree Protocol". They are further referenced to (I.F.B. No. WA77-B133, Appendix B, Sampling and Analysis for Priority Pollutants, US EPA).

Bromochloromethane, 2-Bromo-1-chloropropene and 1,4-dichlorobutane were used as internal standards.

The stock solutions, as received from Supelco, were stored in a freezer. Dilutions were stored in the refrigerator in 15 ml hypovials until one hour before analysis. Standards were prepared to give concentration levels of 10 µg/L (5 ng injected) and 100 ug/L (50 ng injected). An additional standard at 50 ug/L (25 ng injected was analyzed to verify linearity. Internal standards were prepared at 20 ug/L; 5 µl (100 ng injected) was used to spike each standard and sample.

III. Quality Assurance

All six samples were analyzed in duplicate. A blank was prepared using 1/2 ml of soil and 5 mls of distilled water. The blank was analyzed each day to verify the absence of sample handling contamination. Three spiked samples were prepared at 10 or 20 ug/L, two from the lab blank and one an actual sample.

Linearity was verified with a three point curve (10, 50 and 100 ug/L) and a three component internal standard was added to each sample and standard.

The significant amount of headspace and the non uniformity of each sample limits the quantitative conclusions that normally could be assumed with the rigorous quality assurance protocal. Sample 00003 was the most obvious example; a mixture of soil and black sludge that was impossible to accurately reproduce in the transfer.

IV. Results and Conclusions

The results are listed in Table 1. % recoveries from the three spikes are listed in Table 2. Chromatograms of each sample follow the tables.

Nan Simon

jmw/

attachments

TABLE 1

RESULTS SUMMARY

C.S. Log #	20811	20812	20813*	20814**	20815	20816
Sample I.D.	00061	00002	00003	00092	00090	00062
Chloromethane	ND	ND	ND	ND	ND	ND
Bromomethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Vinylchloride	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Chloroethane	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
Methylene Chloride	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
1.1-Dichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1-Dichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trans-1,2-Dichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Chloroform	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,2-Dichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1,1-Trichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Carbon Tetrachloride	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
Bromodichloromethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,2-Dichloropropane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trans-1,3-Dichloropropene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Dibromochloromethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Cis-1,3-Dichloropropene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Benzene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Bromoform	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
1,1,2,2-Tetrachloroethene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1,2,2-Tetrachloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Toluene	ND_{10}	ND_{10}	19 11	ND_{10}	ND_{10}	ND_{10}
Chlorobenzene	ND_{10}	ND_{10}	134 66	ND_{10}	ND_{10}	ND_{10}
Ethylbenzene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}

* Xylenes also detected

** A significant amount of dichlorobenzene was detected

TABLE II

% RECOVERY FROM SPIKED SOIL

	D.L. ug/L	Blank Soil @ 10 ug/L	Blank Soil @ 20 ug/L	20811-00061 Soil @ 20 ug/L
Chloromethane	No std.	ND	ND	ND
Bromomethane	10	136%	103%	110%
Vinylchloride	10	103	105	117
Chloroethane	50	ND	ND	123
Methylene Chloride	10	143	161	550*
Trichlorofluoromethane	No std.	ND	ND	ND
1.1-Dichloroethylene	10	108	105	103
1,1-Dichloroethane	10	102	92	114
Trans-1,2-Dichloroethylene	10	100	94	111
Chloroform	10	106	97	100
1,2-Dichloroethane	10	140	100	110
1,1,1-Trichloroethane	10	109	102	121
Carbon Tetrachloride	50	ND	ND	ND
Bromodichloromethane	10	105	101	115
1,2-Dichloropropane	10	147	103	84
Trans-1,3-Dichloropropene	10	90	78	148
Trichloroethylene	10	84	76	95
Dibromochloromethane	10	82	98	101
Cis-1,3-Dichloropropene	10	143	100	110
Benzene	10	96	88	105
Bromoform	50	ND	ND	ND
1,1,2,2-Tetrachloroethene	10	158	155	144
1,1,2,2-Tetrachloroethane	10	83	74	67
Toluene	10	125	138	580*
Chlorobenzene	10	94	85	105
Ethylbenzene	10	108	98	124

* It can reasonably be assumed that the large recovery is contribution from the sample #20811 - identified as 00061. However, neither compound was found in the unspiked sample.

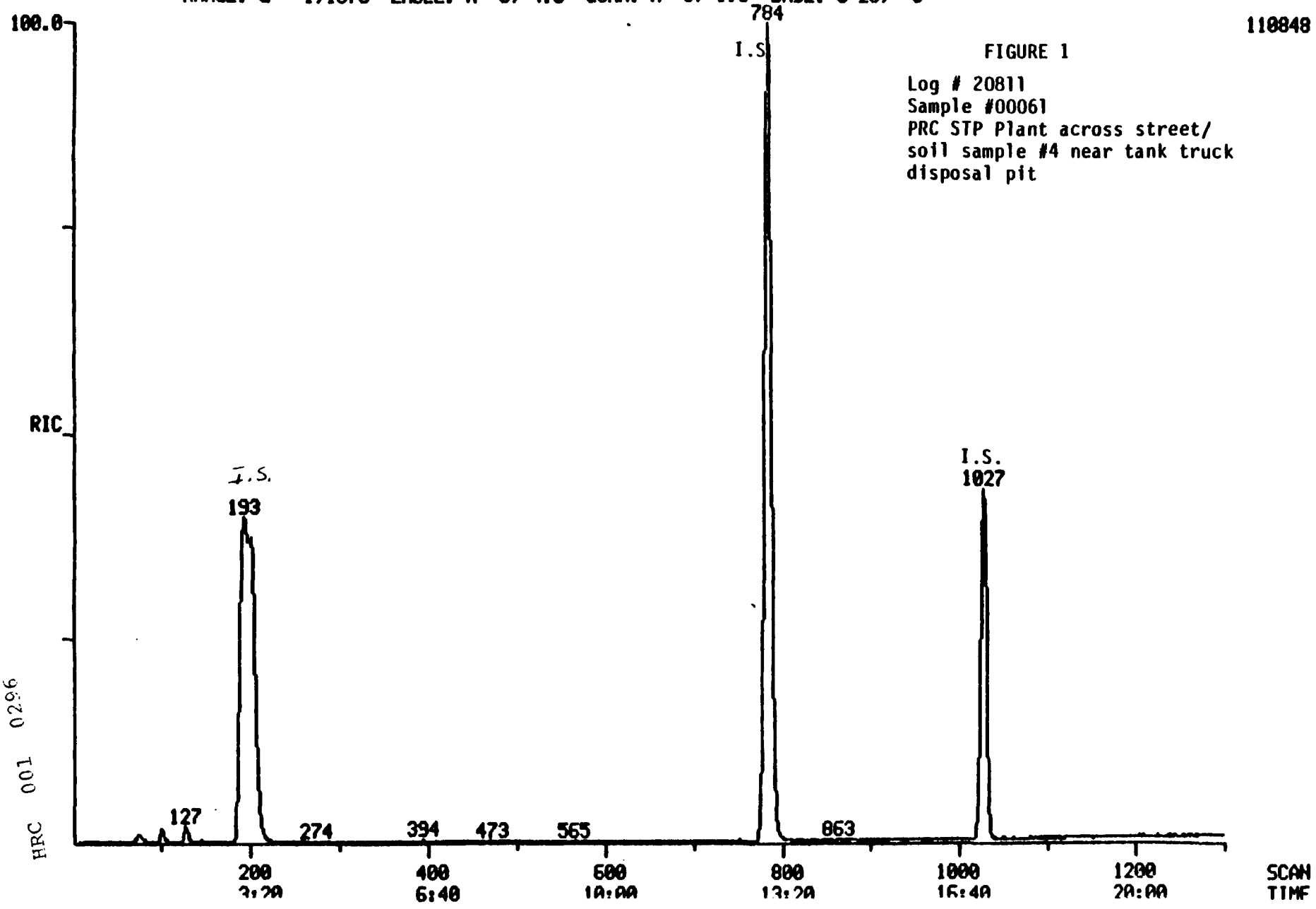


FIGURE 1

Log # 20811
Sample #00061
PRC STP Plant across street/
soil sample #4 near tank truck
disposal pit

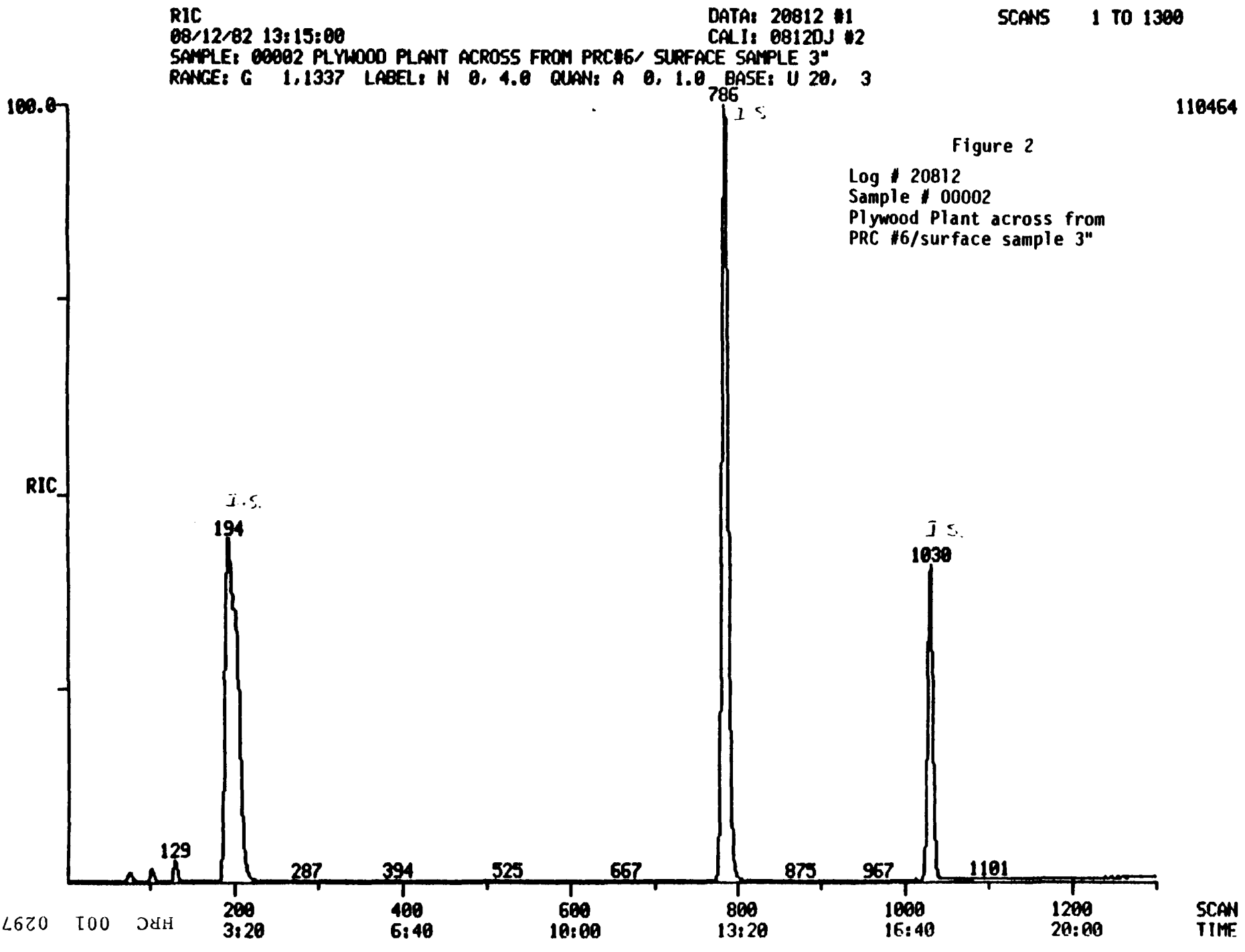


Figure 2

Log # 20812
Sample # 00002
Plywood Plant across from
PRC #6/surface sample 3"

RIC
08/12/82 13:49:00
SAMPLE: 00003 STP PLANT ACROSS PRC SEWER BOTTOMS IN SEWER DUMP SPOT #5
RANGE: G 1,1494 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3

DATA: 20813 #1
CALI: 0812DJ #2
SCANS 1 TO 1494

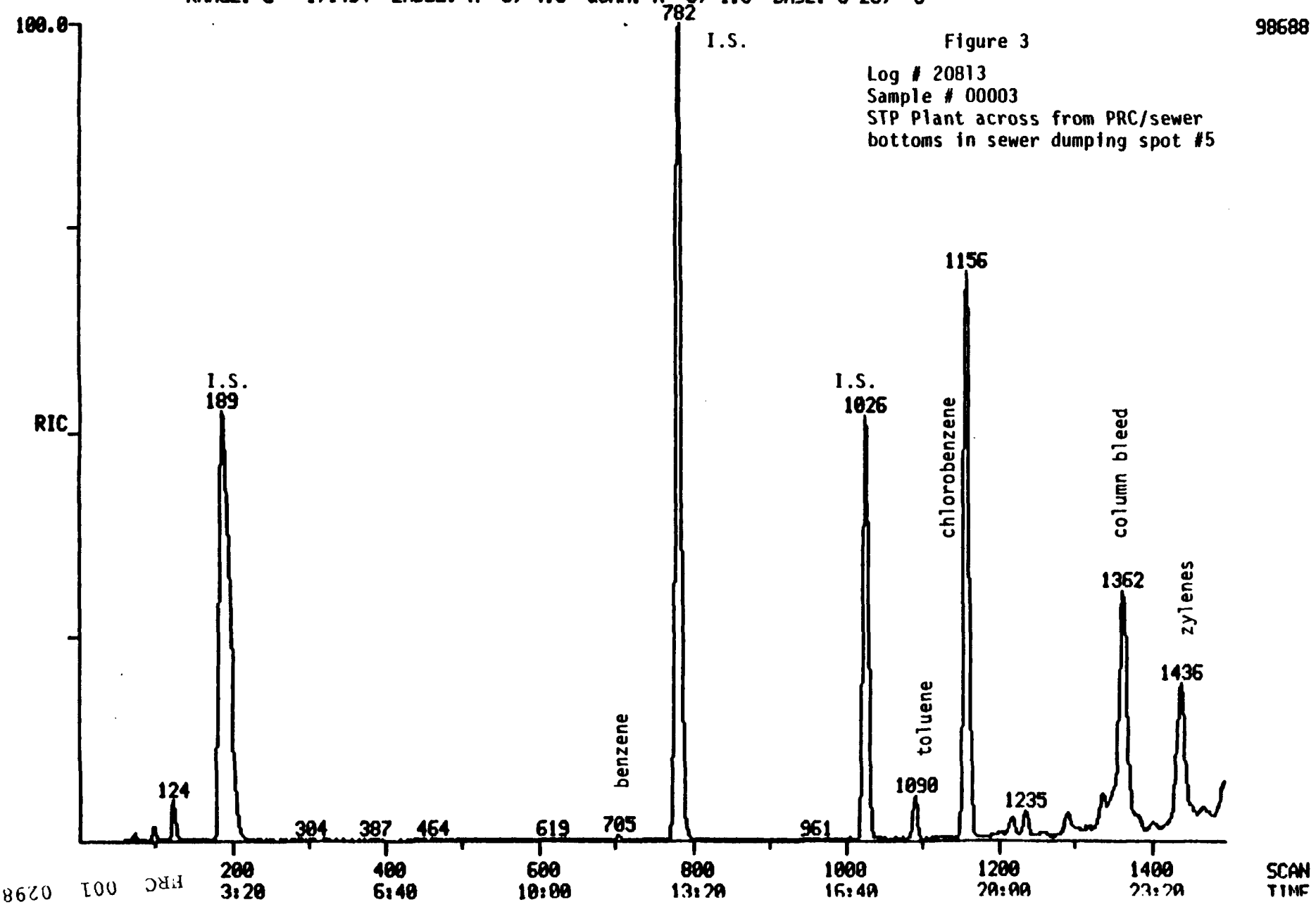


Figure 3

Log # 20813
Sample # 00003
STP Plant across from PRC/sewer
bottoms in sewer dumping spot #5

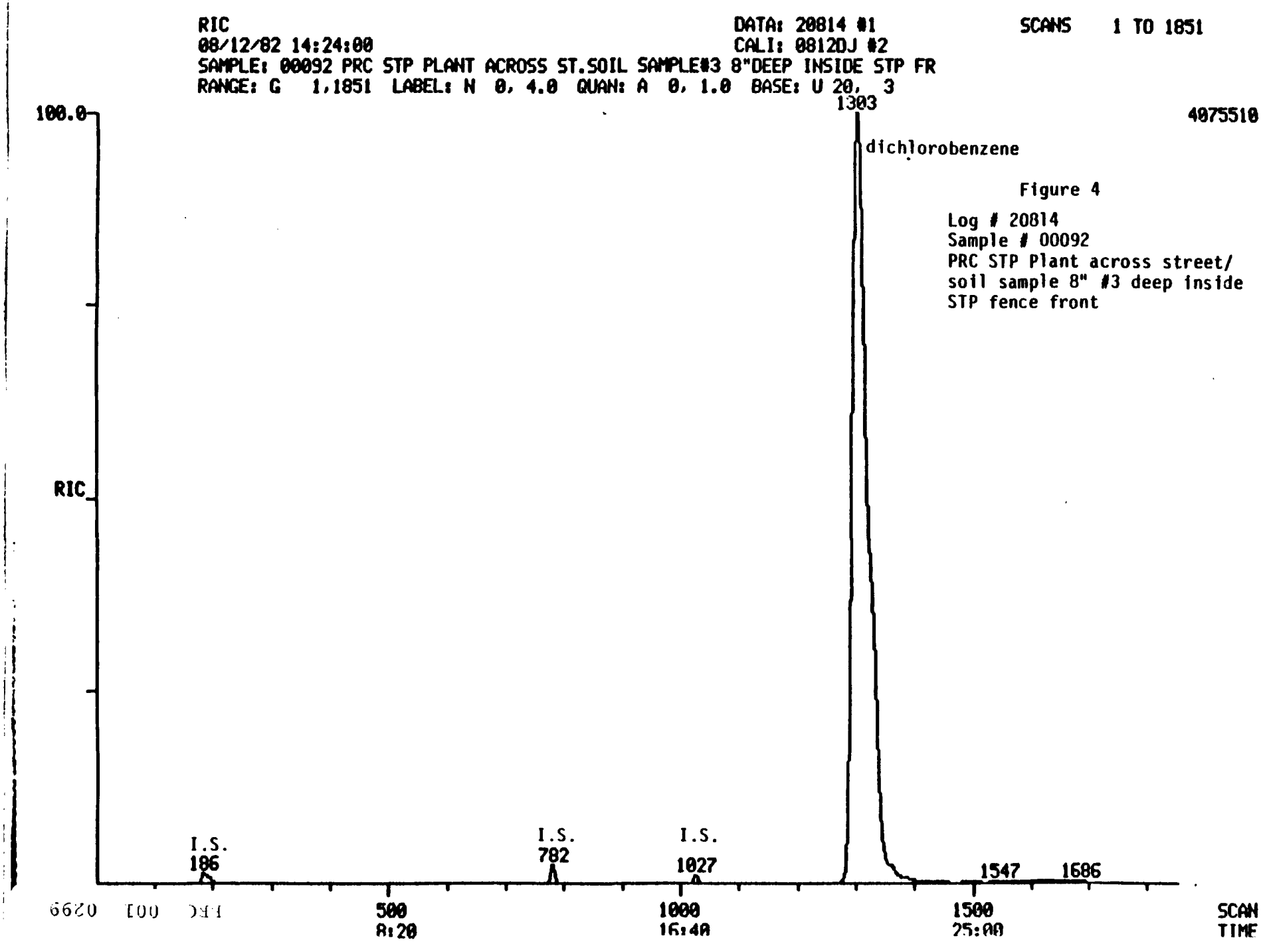


Figure 4

Log # 20814
Sample # 00092
PRC STP Plant across street/
soil sample 8" #3 deep inside
STP fence front

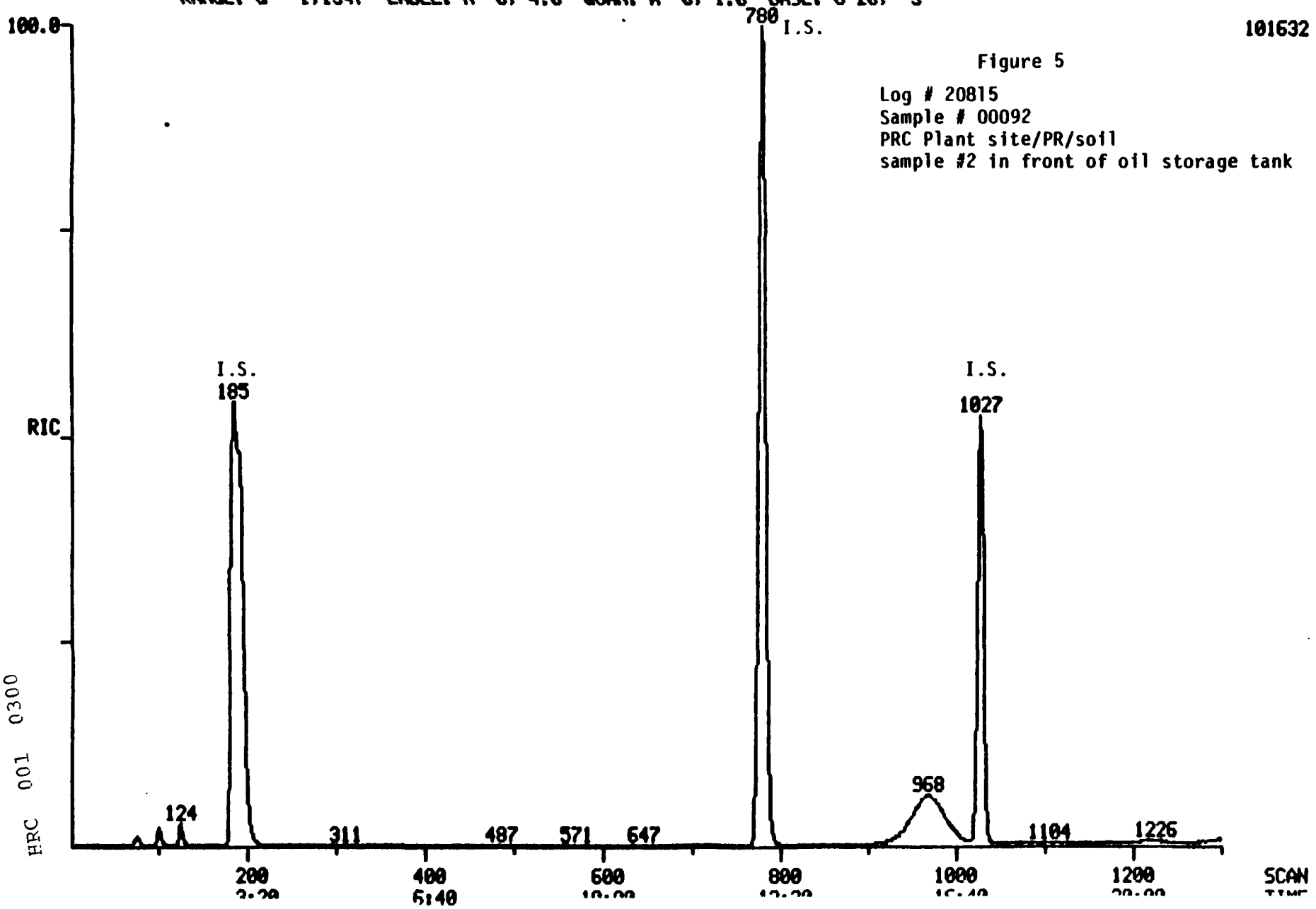


Figure 5

Log # 20815
Sample # 00092
PRC Plant site/PR/soil
sample #2 in front of oil storage tank

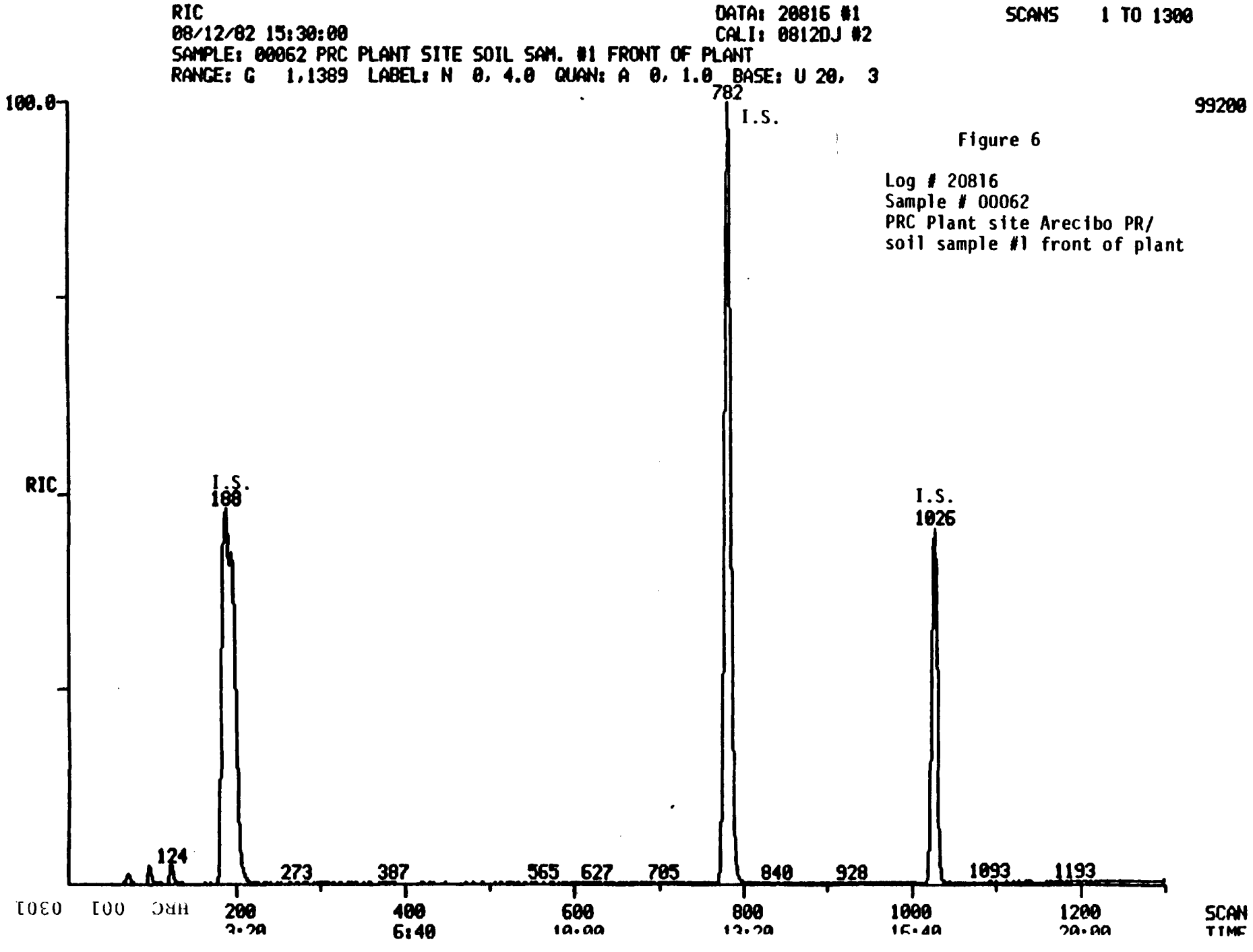


Figure 6

Log # 20816
Sample # 00062
PRC Plant site Arecibo PR/
soil sample #1 front of plant

APPENDIX B-2

TYPICAL ETC REPORT

ETC ENVIRONMENTAL TESTING and CERTIFICATION

October 4, 1984

TECHNICAL REPORT

for

WHITEMAN, OSTERMAN & HANNA
99 WASHINGTON AVE.
ALBANY, NY 12210

PRIVILEGED & CONFIDENTIAL
PREPARED AT THE REQUEST
OF LEGAL COUNSEL

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN, & HANNA	WOHHICKGWM	W137A1001A1	840130	1530	

ENVIRONMENTAL TESTING and CERTIFICATION CORPORATION

Denis C. K. Lin, Ph.D.
Vice President
Research and Operations

HRC 001 0303

284 RARITAN CENTER PARKWAY - EDISON, NJ 08837 (201) 225-5600

TABLE OF CONTENTS

INTRODUCTION

This report contains the analytical results on your water samples, submitted on February 2, 1984. It is designed to satisfy the needs of your people at various levels in your organization.

The results we obtained on your sample are presented in a tabular format immediately after this introduction. Included with the sample results, the quality assurance data on your specific sample are tabulated to verify the validity of the results obtained. The quality assurance data include those obtained on the blank, the spiked blank, the replicate and the spiked sample (commonly known as matrix spike). Also presented in the quality assurance data report is the verification of the proper functioning of the instruments used. The gas chromatograms and/or mass spectra generated in the analysis of your sample are included in the Appendix of this report. The chain of custody record for your sample is included at the end of this report.

The established methods we used in the analysis of your sample are described in the Methodology section after the Results. In the analysis we followed a rigidly controlled Quality Assurance Protocol. This Protocol is described after the Methodology section.

We hope our report format is useful in assisting you to obtain pertinent information on your sample.

RESULTS

The results obtained on your sample and the accompanying quality assurance data are listed in Table 1.

The data on the recovery of the surrogates in your sample and the certification of the GC/MS systems used in the analysis of your sample are listed in Table 2.

The sample extract was qualitatively analyzed by GC/ECD for the presence of Aroclors. If present, the Aroclors were quantitated.

The sample chromatograms were compared qualitatively to chromatograms of all 7 Aroclors - 1016, 1221, 1232, 1242, 1248, 1254, and 1260 for matching peaks. Quantitation was based on a three point calibration curve for Aroclor 1248. The data are tabulated in Table 1; this quality assurance data obtained on the Method Blank, Replicate and Matrix Spike analyses. The methodology and quality assurance protocol follow Table 1. Sample and standard chromatograms are included in the appendix of this report.

The Chain-of-Custody Record on your sample is also included at the end of this Report.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

MAY 8, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds - GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGAM	W137A1001A1	840130	1530	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l a	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Recov
	1,1-Dichloroethylene	ND	10	ND	ND	ND	18	88	ND	18	96
	Tetrachloroethylene	ND	10	ND	ND	ND	18	99	ND	18	106
	Toluene	ND	10	ND	ND	ND	18	98	ND	18	89
	1,2-Trans-dichloroethylene	ND	10	ND	ND	ND	18	81	ND	18	89
	Trichloroethylene	ND	10	ND	ND	ND	18	87	ND	18	90
	Vinyl chloride	ND	5 b	ND	ND	ND	18	100	ND	18	104
	Styrene	ND	10 b	ND	ND	ND	18	98	ND	18	93

a EPA published Method Detection Limit.

b ETC established Method Detection Limit for this particular sample.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

JUN 26, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

BASE/NEUTRAL COMPOUNDS - GC/MS ANALYSIS DATA (QR03)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGMM	W137A1001A1	840130	1530	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l a	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Recov
	bis(2-Ethylhexyl)phthalate	ND	10	ND	ND	ND	30	108	ND	30	55
	Butyl benzyl phthalate	- b		ND	ND	ND	30	18	ND	30	20
	Diethyl phthalate	- b		ND	ND	ND	30	3	ND	30	3
	Dimethyl phthalate	- b		ND	ND	ND	30	0	ND	30	0
	Di-n-butyl phthalate	- b		ND	ND	ND	30	28	ND	30	51
	Di-n-octyl phthalate	ND	10	ND	ND	ND	30	102	ND	30	58
	Moca	ND	10 c	ND	ND	ND	60	94	ND	60	58

a EPA published method detection limit.
b Not Determinable.
c ETC estimated method detection limit.

HRC 001 0307

ETC ENVIRONMENTAL TESTING and CERTIFICATION

March 20, 1984

TABLE 1: QUANTITATIVE RESULTS

Metals, Cyanide and Phenols – Analysis Data (QR05)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGMM	W137A1001A1	840130	1530	

NPDES Number	Compound	Results: Sample Concen. ug/l	Results: MDL ug/l
4M	Cadmium	ND	50
6M	Copper	ND	200
7M	Lead	ND	6
8M	Mercury	ND	0.3
13M	Zinc	64	50
15M	Phenolics, Total	ND	50
	Barium	ND	1000

ETC ENVIRONMENTAL TESTING and CERTIFICATION

March 30, 1984

TABLE 1: QUANTITATIVE RESULTS

Conventionals Analysis Data (QR12)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGMM	WI37A1001A1	840130	1530	

Parameter	Results							
	Sample Measure	MDL	Units of Measure					
Chemical Oxygen Demand (COD)	3	2	mg/l					
pH	5 1		std					
Specific Conductance	310	100	umhos/cm					
Sulfate as SO4	13	2	mg/l					
Total Organic Carbon	1 2	1	mg/l					

FRC 001 0309

ETC ENVIRONMENTAL TESTING and CERTIFICATION

March 20, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Conventional Analysis Data

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGWM	W137A1001A1	840130	1530	

Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
	Sample Concen. mg/l	MDL mg/l*	First mg/l	Second mg/l	Blank Data mg/l	Amount Added mg/l	% Recov	Unspiked Sample mg/l	Amount Added mg/l	% Recov
Nitrate as N	13	0.1	13	20	ND	1.0	102	20	25	118

HRC 001 0310

ETC ENVIRONMENTAL TESTING and CERTIFICATION

MAR 12, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors - GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
D8923	WHITEMAN, OSTERMAN & HANNA	WOHHICKGAM	W137A1001A1	840130	1530	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l *	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Recov
	Aroclor 1242	ND	10	ND	ND	ND	0	-	-	-	-
	Aroclor 1254	ND	10	ND	ND	ND	0	-	-	-	-
	Aroclor 1260	ND	10	ND	ND	ND	0	-	-	-	-
	Aroclor 1248	ND	10	ND	ND	ND	20	97	ND	20	104
	Aroclor 1232	ND	10	ND	ND	ND	0	-	-	-	-
	Aroclor 1221	ND	10	ND	ND	ND	0	-	-	-	-
	Aroclor 1016	ND	10	ND	ND	ND	0	-	-	-	-

* MDL calculated for each sample matrix.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

February 27, 1984

TABLE 2: METHOD PERFORMANCE DATA

Surrogate Recovery - GC/MS Data (QR20)

Chain of Custody Data Required for ETC Data Management Summary Reports

D8923

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours

Compound	Amount Added ug	% Recovery	Control Limits *	
			Lower	Upper
VOLATILE FRACTION				
Bromochloromethane	.200	103	79	127
Benzene, d_6	.150	116	63	122
Fluorobenzene	.150	123	74	122
1,4-Dichlorobutane	.200	76	75	117
Pentafluorobenzene	.150	133	58	124
Ethylbenzene, d_{10}	.150	121	78	114
ACID FRACTION				
2-Fluorophenol	-	-	20	86
Pentafluorophenol	-	-	37	127
BASE/NEUTRAL FRACTION				
2-Fluorobiphenyl	80	78	62	122
1-Fluoronaphthalene	80	102	64	104
Nitrobenzene, d_5	80	103	58	105

* Three Standard Deviations About the Mean.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

February 17, 1984

TABLE 2: METHOD PERFORMANCE DATA

GC/MS Tuning Data – Bromofluorobenzene (BFB) for Volatiles Analysis (QR21)

Chain of Custody Data Required for ETC Data Management Summary Reports

D8923

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours

m/z	Ion Abundance Criteria	Abundance (% Base Peak)
50	15-40% of the base peak	28
75	30-60% of the base peak	50
95	Base Peak, 100% relative abundance	100
96	5-9% of the base peak	8
173	Less than 1% of the base peak	<1
174	Greater than 50% of the base peak	67
175	5-9% of mass 174	5
176	Greater than 50% of the base peak	62
177	5-9% of mass 176	4

Date: 840204
Run No: >A0173
Spectrum No: 174
Analyst: R. Albert

February 27, 1984

TABLE 2: METHOD PERFORMANCE DATA

GC/MS Tuning Data – Decafluorotriphenylphospine (DFTPP) for Base/Neutrals Analysis (QR23)

Chain of Custody Data Required for ETC Data Management Summary Reports

D8923

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours

m/z	Ion Abundance Criteria	Abundance (% Base Peak)
51	30-60% of mass 198	60
68	Less than 2% of mass 69	<2
70	Less than 2% of mass 69	<2
127	40-60% of mass 198	44
197	Less than 1% of mass 198	<1
198	Base peak, 100% relative abundance	100
199	5-9% of mass 198	7
275	10-30% of mass 198	21
365	Greater than 1% of mass 198	2
441	Less than mass 443	10
442	Greater than 40% of mass 198	67
443	17-23% of mass 442	13

Date: 840223
Run No: >G1058
Spectrum No: 192
Analyst: K. Weiner

Methodology
for
GC Analysis of Polychlorinated Biphenyls

The methods employed in the analysis of your water sample for polychlorinated biphenyls are established EPA methods taken from the "Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples," June, 1980.

The water method can be summarized as follows: A measured volume of sample, approximately 500 ml, to which sodium sulfate has been added is extracted with methylene chloride. The methylene chloride extract is dried and concentrated to approximately 1 ml. The concentrated extract is transferred to a silica gel column and eluted with hexane. The eluate is concentrated to a final volume of 1 ml and injected into a gas chromatograph equipped with a ^{63}Ni electron capture detector.

The GC operating parameters were as follows:

COLUMN

6' x 4 mm glass 1.5% SP-2250 & 1.95% SP-2401
Supelcoport 100/120 mesh

CARRIER FLOW

60 ml/min. Argon/Methane

COLUMN OVEN

220° C

INJECTOR TEMPERATURE

225° C

DETECTOR TEMPERATURE

325° C

METHODOLOGY

The methods employed in the analysis of your samples are both established EPA methods for priority pollutants in water and modified EPA procedure for priority pollutants in sediments and sludges. Gas chromatography combined with electron impact mass spectrometry (GC/MS) was used for this analysis.

For the analysis of the volatile organic compounds, EPA Method 624 (Federal Register, December 3, 1979, page 69532) was used. A September 1982 modification of EPA Method 624 which allows for the analysis of styrene was included. The method can be summarized as follows: Helium is bubbled through a 5-ml water sample contained in a specially designed purging chamber at ambient temperature. The purgeable volatile organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a mass spectrometer.

For the analysis of volatile organic compounds in sediments and sludges, methods taken from special report No. 1., "Development of Analytical Test Procedures for the Measurement of Organic Priority Pollutants in Sludges and Sediments", June 1979 were used. That method can be summarized as follows: 0.5 ml (0.5 grams) of sediment/sludge was transferred to a Tekmar purging chamber using a tipless disposable pipet. Five mls of reagent water and five mls of an internal standard water solution were added to the purging chamber. The mixture was purged and trapped following the same procedure used in Method 624 for water samples.

For the analysis of the target Base/Neutral priority pollutants, EPA Method 625 (Federal Register, December 3, 1979, page 69540) was used. The procedure includes a September 1982 modification to include the analysis of 3',3'-dichloro 4,4'-diamino dephenyl methane (MOCA). The method can be summarized as follows: A measured volume of sample, approximately 1-liter, was serially extracted with methylene chloride at a pH greater than 11 using a separatory funnel or a continuous extractor. The methylene chloride extract was dried and concentrated to a volume of 1 ml. The concentrate was injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants.

For the analysis of target base neutrals and MOCA in sediment and soils, EPA Method 625 (previously referenced) was applied to an aqueous extract of the sample obtained by using the EP Toxicity extraction procedure found in "RCRA Test Methods For Evaluating Solid Wastes- Physical/Chemical Methods", SW846, May 1980. The EP Toxicity extraction procedure can be summarized as follows: 100g of sediment or sludge are stabalized at pH 5 using 0.5 Normal acetic acid solution. The mixture is diluted to a final volume of 2 liters with distilled water. The entire sample is tumble shaken for 24 hours followed by positive pressure filtration at 75 PSI. The filtrate is extracted and analyzed using EPA Method 625.

For the analysis of PCB's in water and sediment, methods taken from "Manual of Analytical methods for the analysis of Pesticides in Human and Environmental Samples." EPA 600-8-30-038 were used. The water method can be summarized as follows: A measured volume of water sample, approximately 500 ml, to which sodium sulfate has been added, is extracted with methylene chloride. The methylene chloride extract is dried and concentrated to approximately 1 ml. The concentrated extract is transferred to a silica gel column and eluted with hexane. The eluate is concentrated to a final volume of 1 ml and injected into a gas chromatograph equipped with a ^{63}Ni electron capture detector.

The soil method can be summarized as follows: A weighed amount of air dried sample, approximately 2 grams, is soxhlet extracted for 5 hours with 1:1 acetone/hexane solution. The extract is dried and concentrated to approximately 3 ml. The concentrated extract is transferred to a silica gel column and eluted with hexane. The eluate is concentrated to a final volume of 1 ml and injected into a gas chromatograph equipped with a ^{63}Ni electron capture detector.

Qualitative identification of the target priority pollutants was performed initially using the relative retention times, the relative abundance of three characteristic ions, and their ratios. The entire mass spectrum was reviewed before an identification was recorded. Quantitative analysis was performed using an internal standard with a single characteristic ion.

Quality Assurance/Quality Control Procedures (QA/QC)

ETC bases its quality assurance protocols on the following government guidelines:

. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979;

. National Enforcement Investigation Center Policies, and Procedures manual; EPA-330/9/79/001-R, October 1979;

. the recommended guidelines for EPA Methods 624 and 625. (Federal Register, December 3, 1979, pp. 69532-69559); and

. "Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples," EPA 600/8-80-038, June 1980.

. "Determination of 2,3,7,8-TCDD in Soil and Sediment" EPA, Region VII, Kansas City, September 1983.

However, we have modified our protocols to provide a higher level of QA/QC than the guidelines require. For example, we analyze a higher than required number of quality control samples and we pay especially careful attention to the certification of the "reference standard" compounds we use in analysis. Below are listed the key QA/QC elements for the methods we used.

Analysis of Volatile Organic Compounds (EPA Method 624)

- Each batch of 13 samples consists of 9 customer samples (at maximum), one blank sample, one spiked blank, one spiked sample and one replicate sample. This amounts to a 30% quality control factor.
- Three surrogate compounds are added to each sample in the batch of 13.
- At least one blind quality control sample is introduced to the laboratory for analysis for each hundred samples analyzed.
- Each GC/MS is checked and retuned, if necessary, every 8 hours to ensure that its performance on bromofluorobenzene (BFB) meets the EPA criteria.
- A calibration curve for quantitation is prepared using a mixture of Volatile Organic Priority Pollutant "standards" at a minimum of 3 different concentrations and using a mixture of 3 internal standards at a constant concentration.
- The calibration curve is verified with a mixture of priority pollutant standards every 8 hours.
- Results are compared to the acceptance criteria given in Method 624; any that do not meet the criteria are re-analyzed.

Analysis of Organic Compounds Extracted in Acid or Base/Neutral Solutions (EPA Method 625)

- Each batch of 20 samples consists of 16 customer samples (at maximum), one blank sample, one spiked blank, one sample spiked with the priority pollutant standard mixture and a duplicate customer sample. This amounts to a 20% quality control factor.
- Five surrogate compounds are added to each sample in the batch of 20.
- At least one blind quality control sample is introduced to the laboratory for analysis for each hundred samples analyzed.

- Each GC/MS is checked and retuned, if necessary, every eight hours to ensure that its performance on decafluorotriphenylphosphine (DFTPP) meets the EPA criteria.
- A calibration curve for quantitation is prepared using a mixture of standards composed of either the Organic Acid or Base/Neutral Extractable Compounds at a minimum of 3 concentrations and using 2,2'-difluorobiphenyl as an internal standard.
- The calibration curve is verified with a mixture of priority pollutant standards every eight hours.
- Results are compared to the acceptance criteria given in Method 625; any that do not meet the criteria are re-analyzed.

Analysis of Metals

All Samples

- New standards are prepared for each batch of samples.
- Normal calibration is performed using a blank sample and four standards that have been through the sample preparation procedure. A regression analysis is used to construct the calibration curve.
- For each sample analysis that requires the use of the "method of additions" technique, a three point calibration is performed using U.S. EPA "Methods for Chemical Analysis of Water and Wastes, 1979". Results are obtained using linear regression analysis. Any results with a coefficient of correlation below 0.990 are considered erroneous, necessitating raw data editing or sample re-analysis.
- In constructing the normal calibration curves the lowest concentration levels we use are values greater than or equal to 5 times the Instrumental Detection Limit (IDL).
- All calibration standards are analyzed in duplicate, at a minimum.
- Independent reference standards are used to check the accuracy of calibration standards.
- A check standard is analyzed every ten samples to validate the normal calibration curve.

Homogeneous Samples (except for Mercury analysis)

Samples are analyzed in batches of 30 or less. For batches in which the sample matrices are homogeneous, the QC program is a minimum of 42% and consists of analyzing:

- 3 Replicates;
- 2 Replicate spikes;
- 2 Replicate independent reference standards;
- 8 Calibration standards (processed using the sample preparation method);
- 2 Blanks (processed using the sample preparation method);
- 4 Calibration standards (without sample preparation); and
- 1 Blank (without sample preparation).

Heterogeneous Samples (except for Mercury analysis)

Samples are analyzed in batches of 30 or less. For batches in which the sample matrices are heterogeneous, the QC program is a minimum of 65% and consists of analyzing:

- each of the 30 customer samples in duplicate;
- 4 Replicates;
- 4 Replicate spikes;
- 2 Replicate independent reference standards;
- 8 Calibration standards (processed using the sample preparation method);
- 2 Blanks (processed using the sample preparation method);
- 4 Calibration standards (without sample preparation); and
- 1 Blank (without sample preparation).

Analysis of Mercury

To analyze samples for mercury we group them by matrix in batches of 20 or less. Our QC program is a minimum of 66% and consists of analyzing:

- each of the 20 customer samples in duplicate;
- 3 Replicates;
- 2 Replicate spikes;
- 2 Replicate independent reference standards;
- 10 Calibration standards (processed using the sample preparation method); and
- 2 Blanks.

Analysis of Pesticides, Herbicides and PCB's (EPA Method 608)

Pesticide, herbicide and PCB samples are grouped in batches of 16 customer samples or less according to the type of analysis to be performed. The QC program for each of these three types of analyses is a minimum of 20% and consists of analyzing:

- 1 blank sample;
- 1 spiked blank sample;
- 1 replicate sample;
- 1 replicate spiked sample, and
- 1 blank QC sample for at least each 100 samples analyzed.

The GC instruments are tuned daily to meet performance criteria in Method 608. Because Method 608 lacks data acceptance criteria, ETC has developed its own upper and lower quality control limits. When a test result falls outside the control limits, the test is re-run.

Analysis of Phenols

Phenols are analyzed using a Technicon AutoAnalyzer II GT.

- Absorbance of full scale standards must be within +/- 25% of nominal absorbance.
- Duplicate calibration standards at four different concentrations are run with each batch of customer samples.
- At least one intersample standard is run for each 20 customer samples.
- Gain and carryover standards are analyzed at the end of each run.

Chain-of-Custody

The chain-of-custody procedure is part of our quality assurance protocol. We believe our chain-of-custody record fully complies with the legal requirements of federal, state and local government agencies and of the courts of law. The record covers:

- labeling of sample bottles, packing the Sample Shuttle and transferring the Shuttle under seal to the custody of a shipper;
- outgoing shipping manifests;
- the chain-of-custody form completed by the person(s) breaking the Shuttle seal, taking the sample, resealing the Shuttle and transferring custody to a shipper;
- incoming shipping manifests;
- breaking the Shuttle's reseal;
- storing each labeled sample bottle in a secured area;
- disposition of each sample to an analyst or technician; and
- the use of the sample in each bottle in a testing procedure appropriate to the intended purpose of the sample.

The record shows for each link in this process:

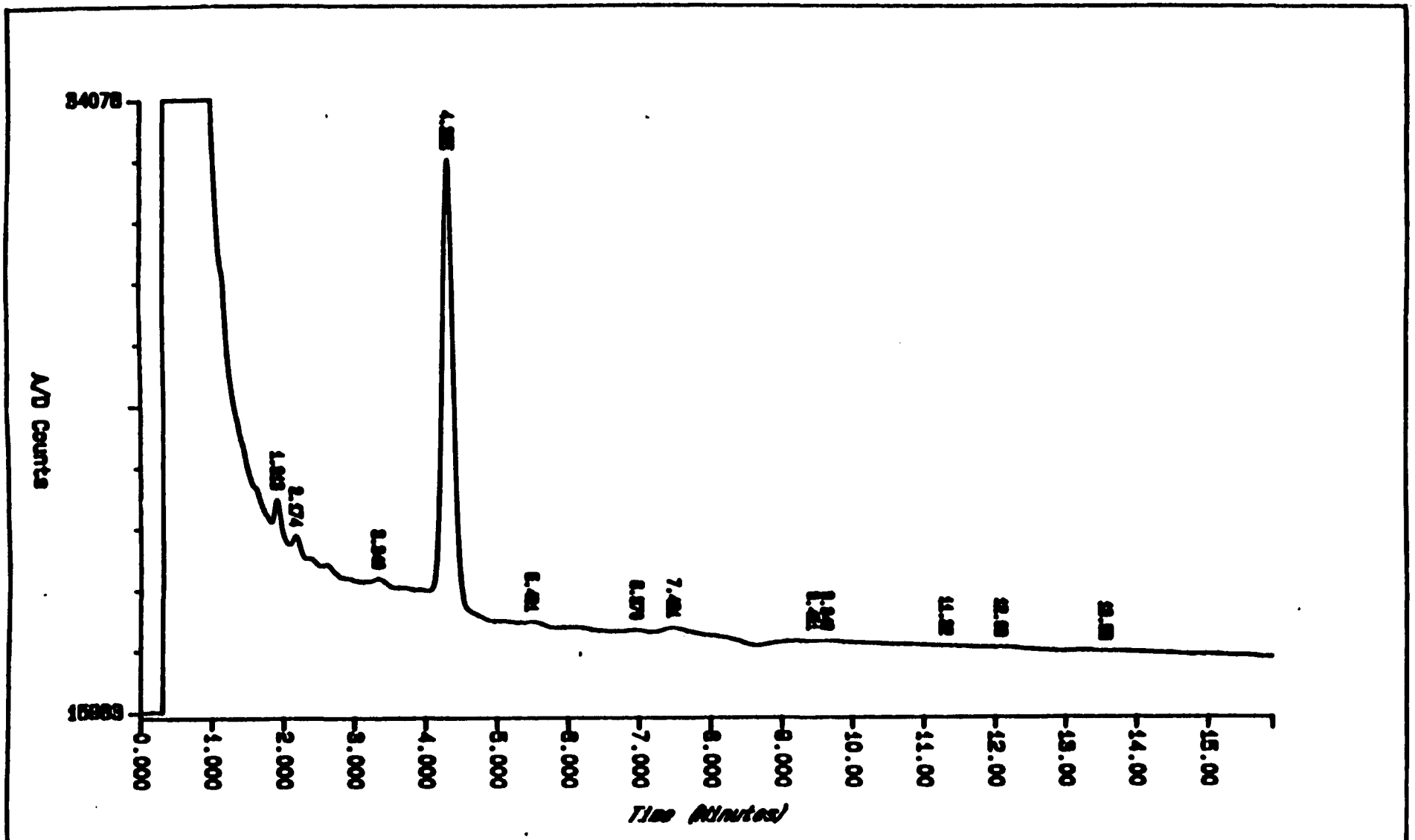
- the person with custody; and
- the time and date each person accepted or relinquished custody.

Appendix A1

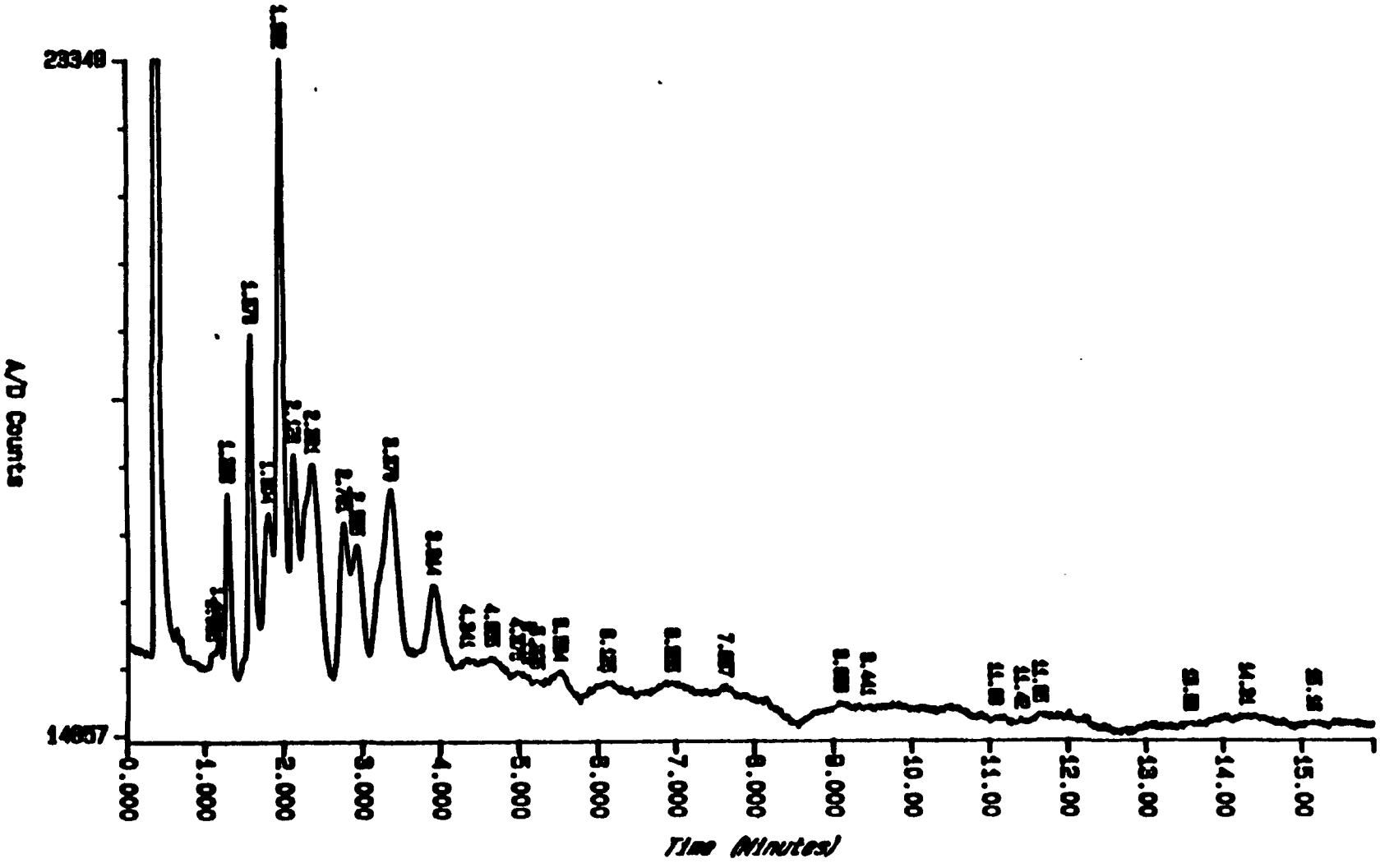
Gas Chromatographic Spectral Data for Quantitated Compounds

1) A reconstructed gas chromatogram for each sample analysed by a GC instrument.

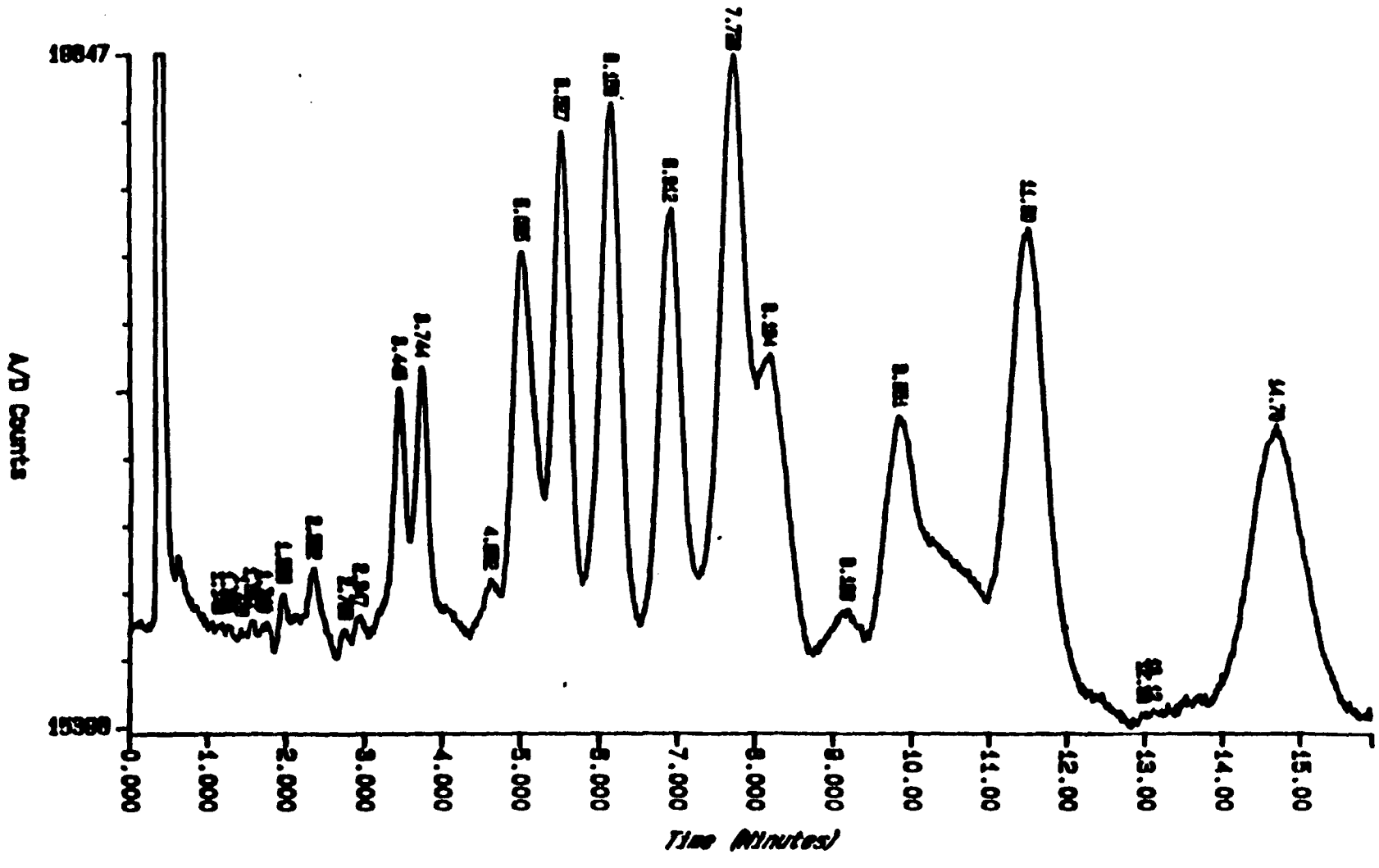
2) A reconstructed gas chromatogram for the appropriate standard compounds analyzed with the same GC under the same operating conditions.



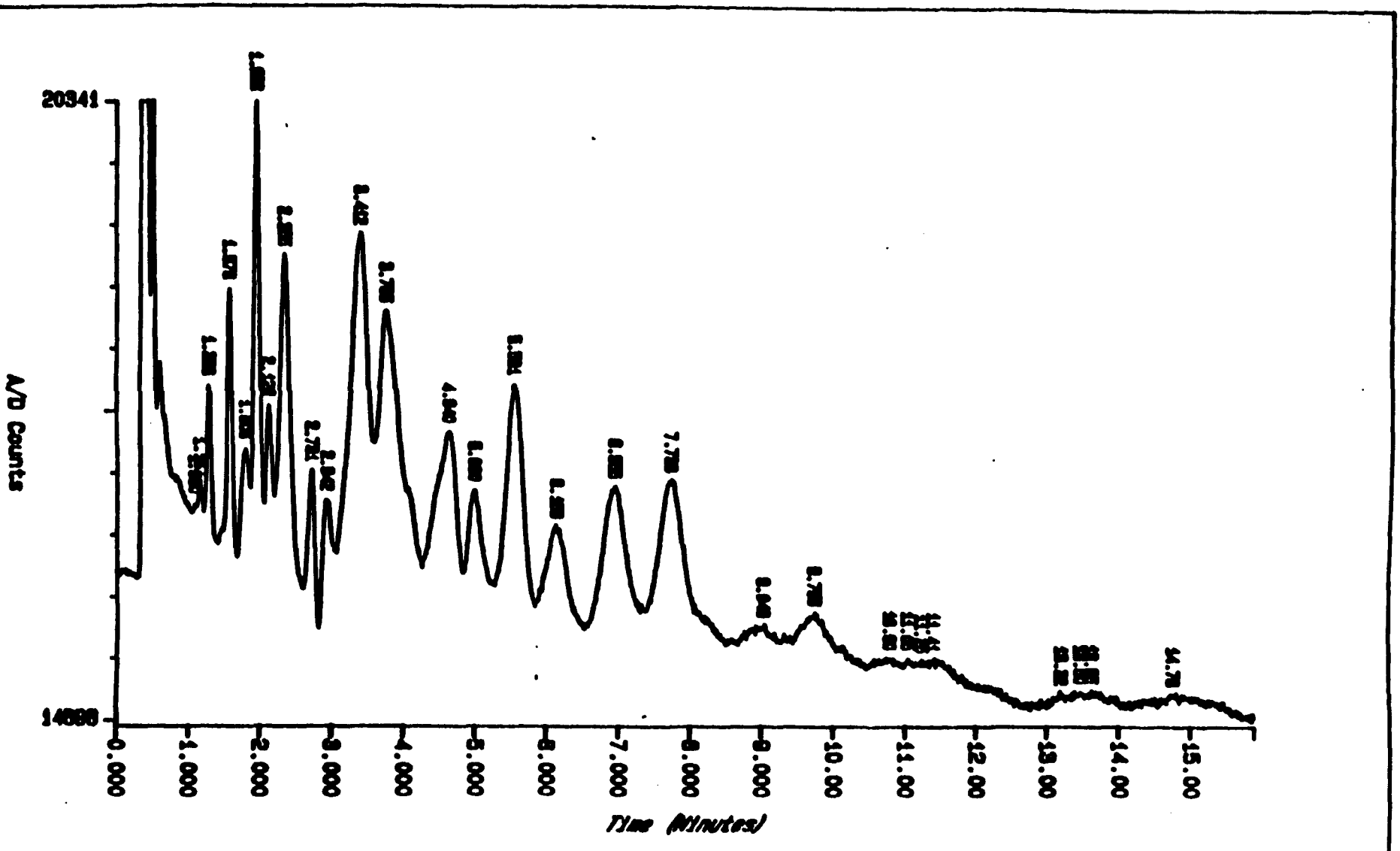
Sample: D8823 Injected at 18:45:28 ON FEB 22, 1984
Raw File: D8823B Proc File: D8823A Method: PCBB5



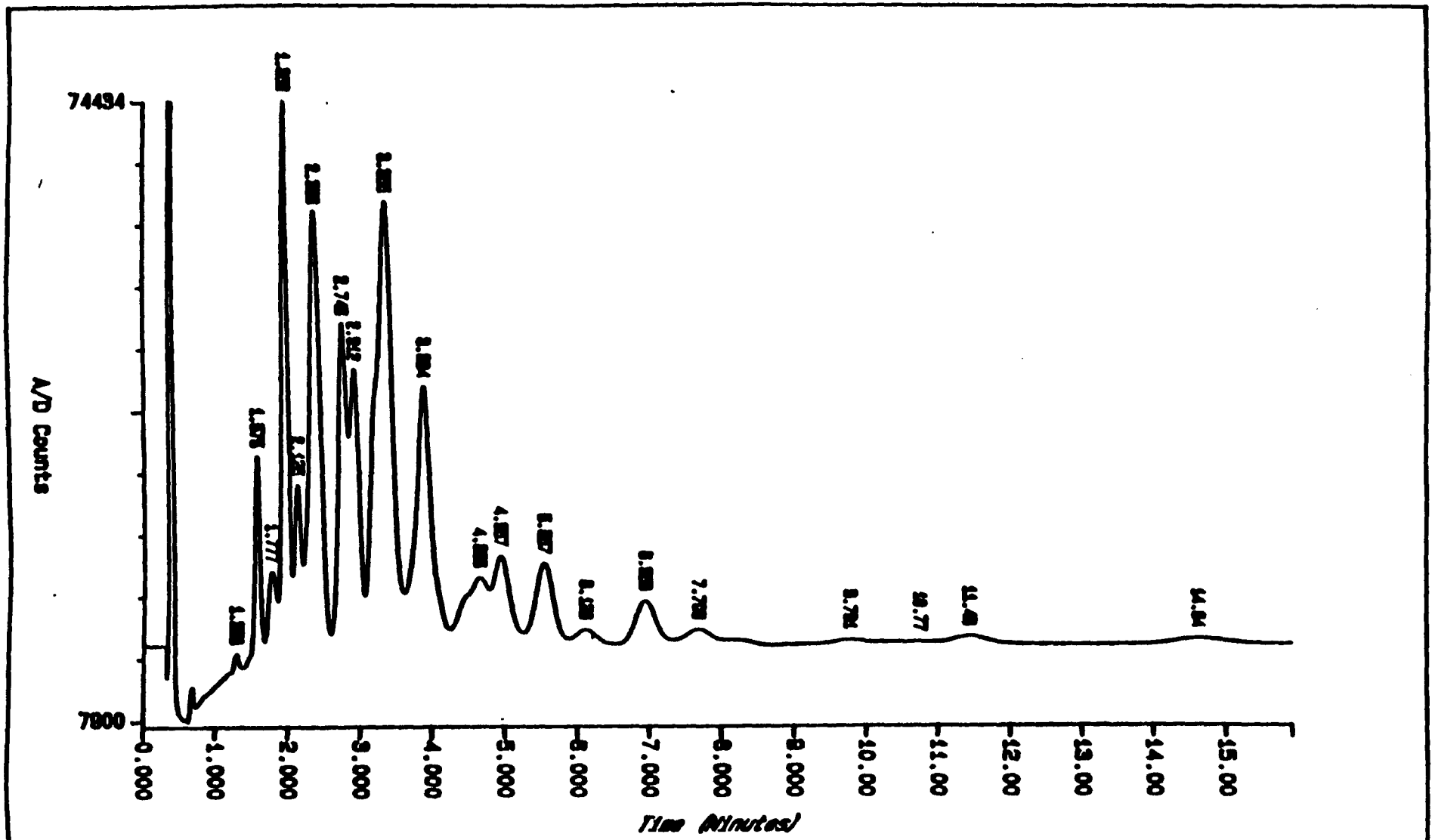
Sample: A1242 STD0.5 Injected at 17:57:10 ON MAR 6, 1984
Raw File: R8032 Proc File: P8032 Method: PCB85



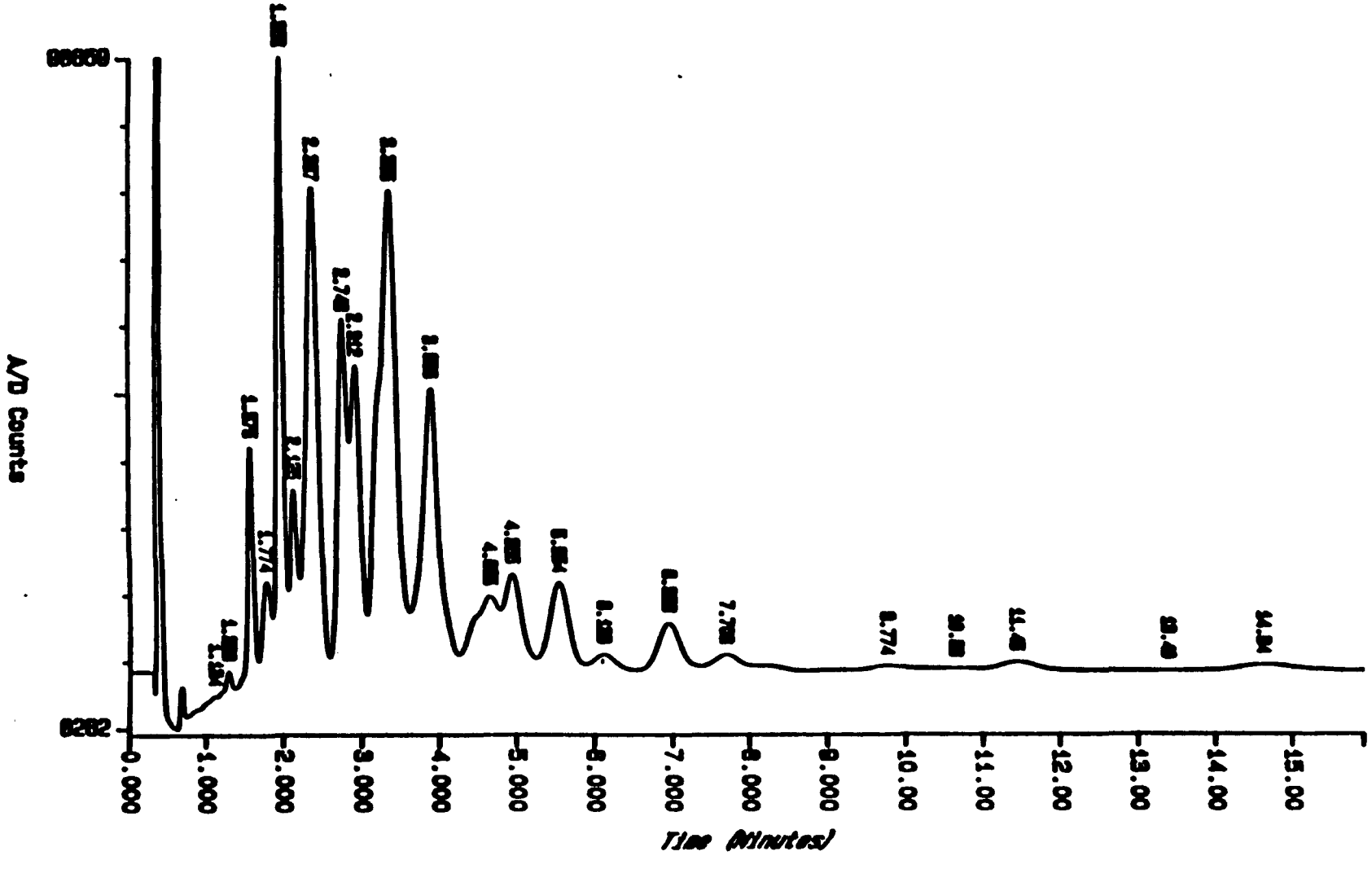
Sample: A1280 STD0.5 Injected at 17:21:28 ON MAR 8, 1984
Raw File: R8030 Proc File: P8030 Method: PCBB5



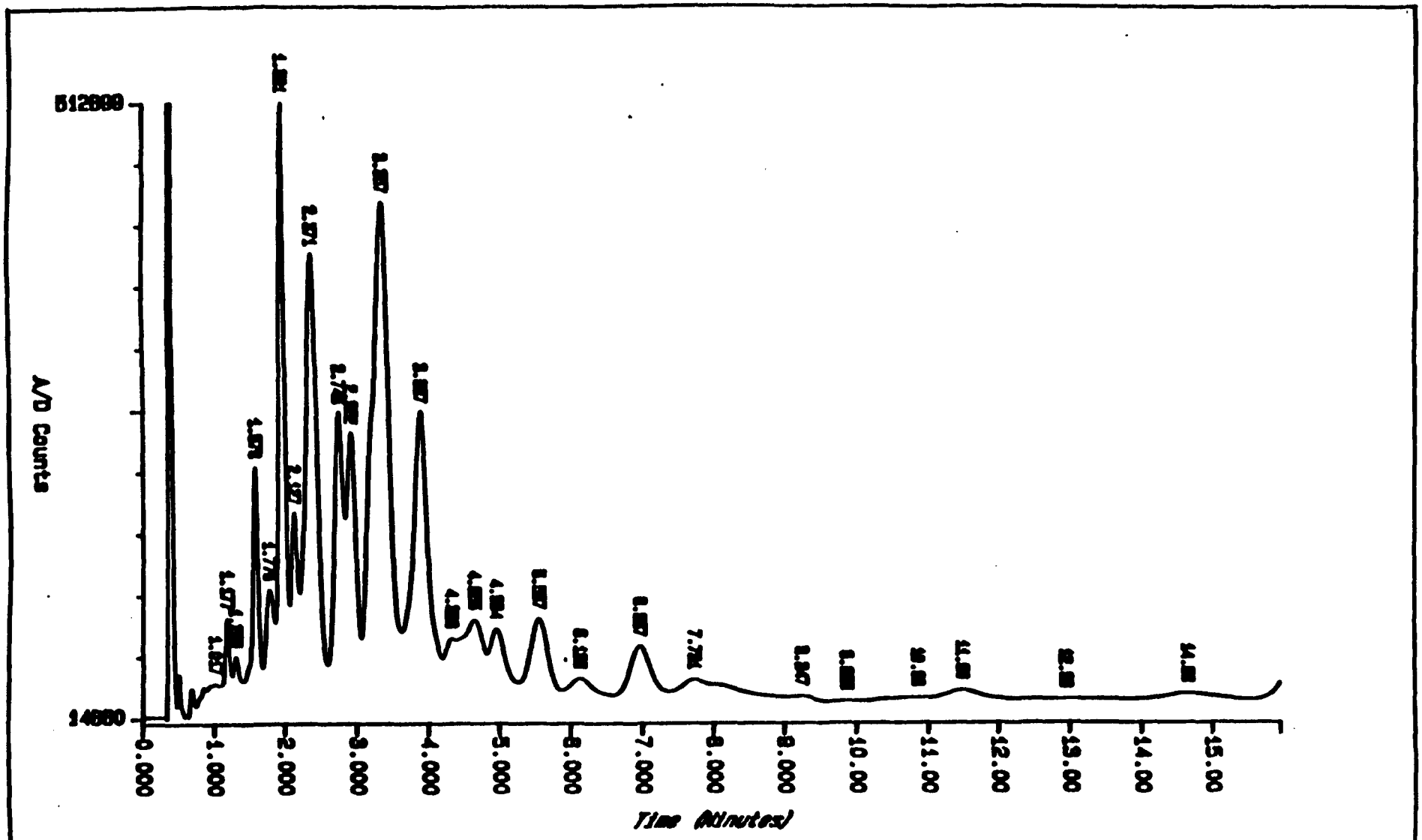
Sample: A1254 STD0.5 Injected at 17:39:17 ON MAR 8, 1984
Raw File: R8031 Proc File: P8031 Method: PCB85



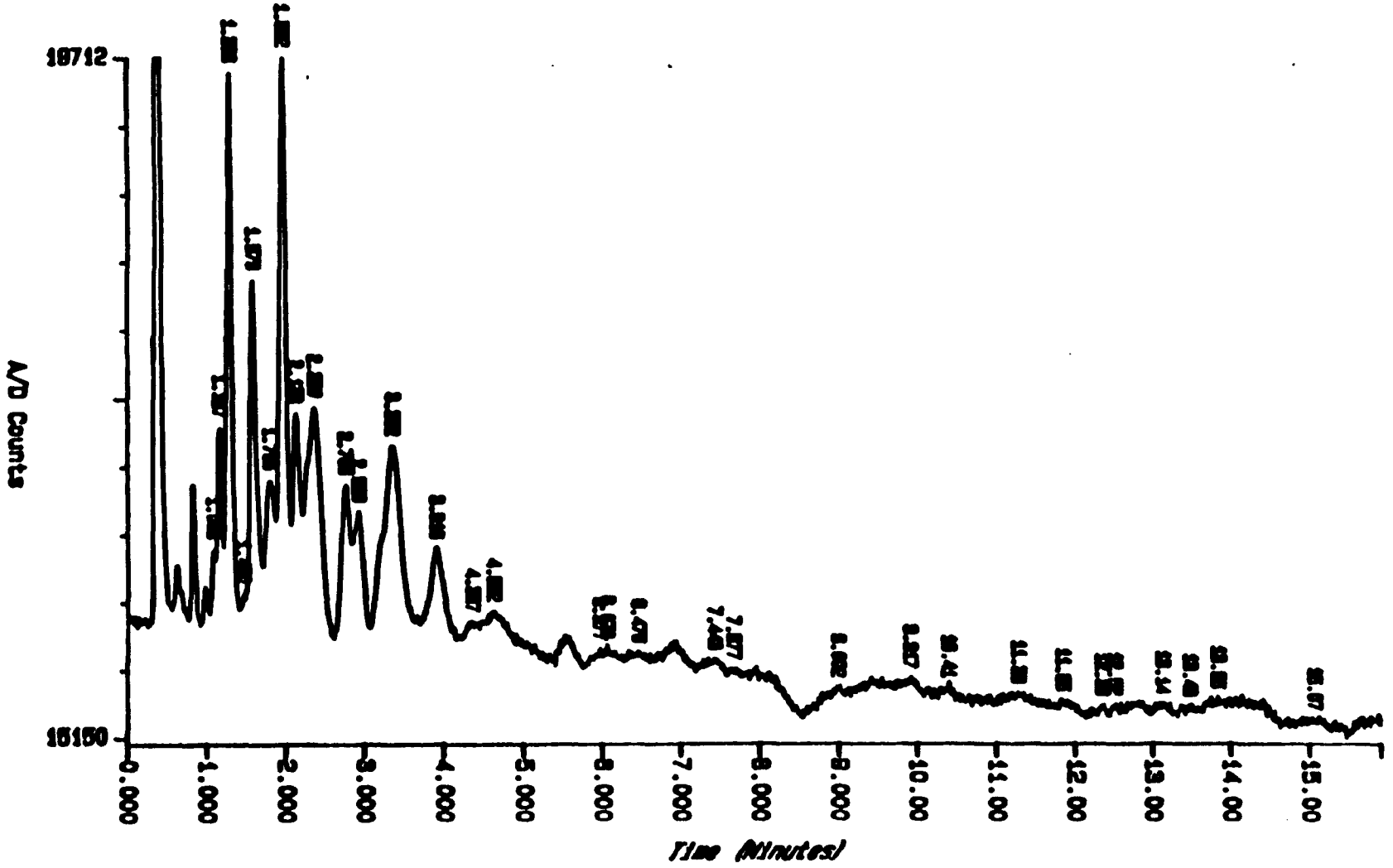
Sample: A1248 STD0.5 Injected at 15:05:51 ON FEB 22, 1984
Raw File: R7728 Proc File: P7728 Method: PCB85



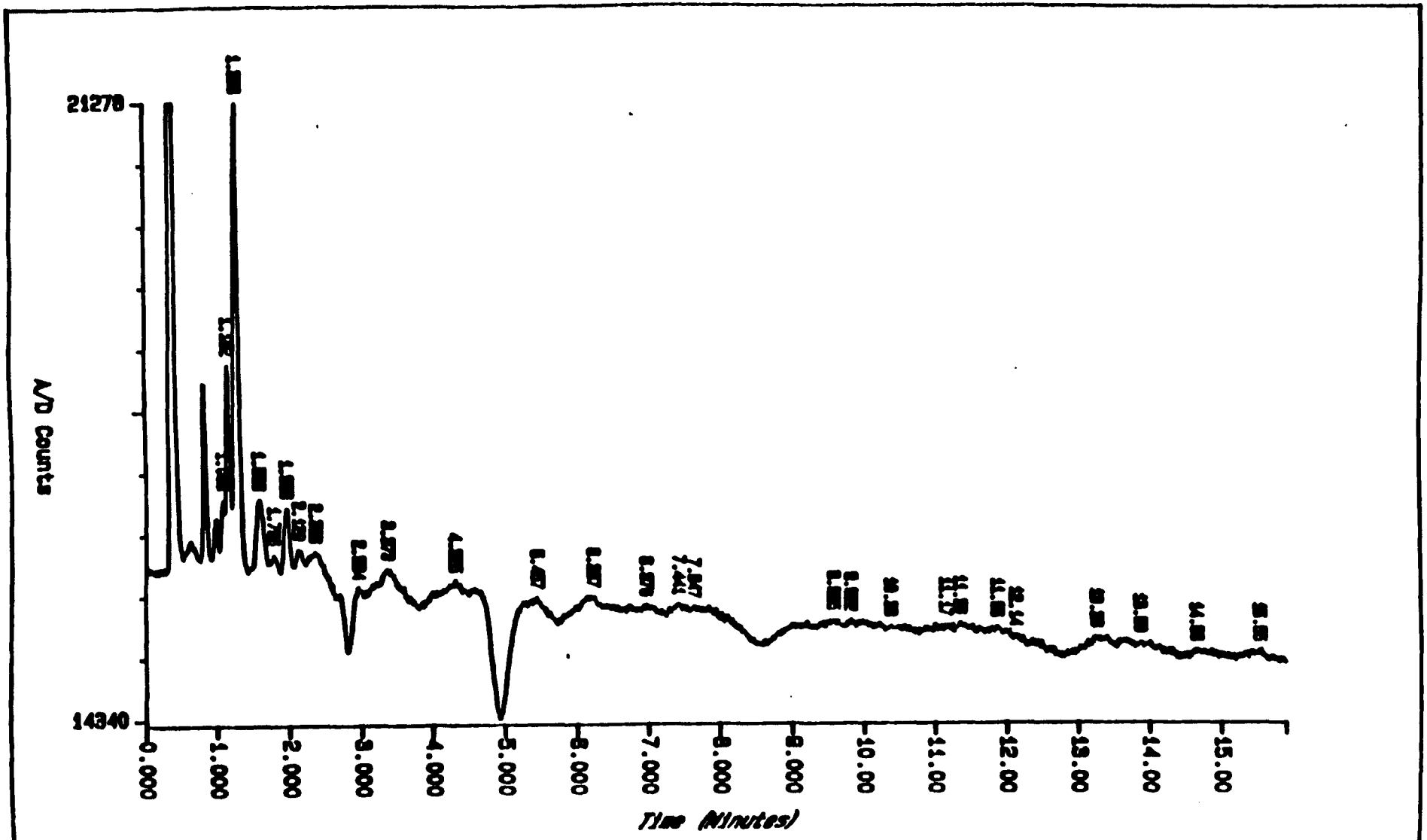
Sample: A1248 STD1.0 Injected at 15:23:25 ON FEB 22, 1984
Raw File: R7729 Proc File: P7729 Method: PCB85



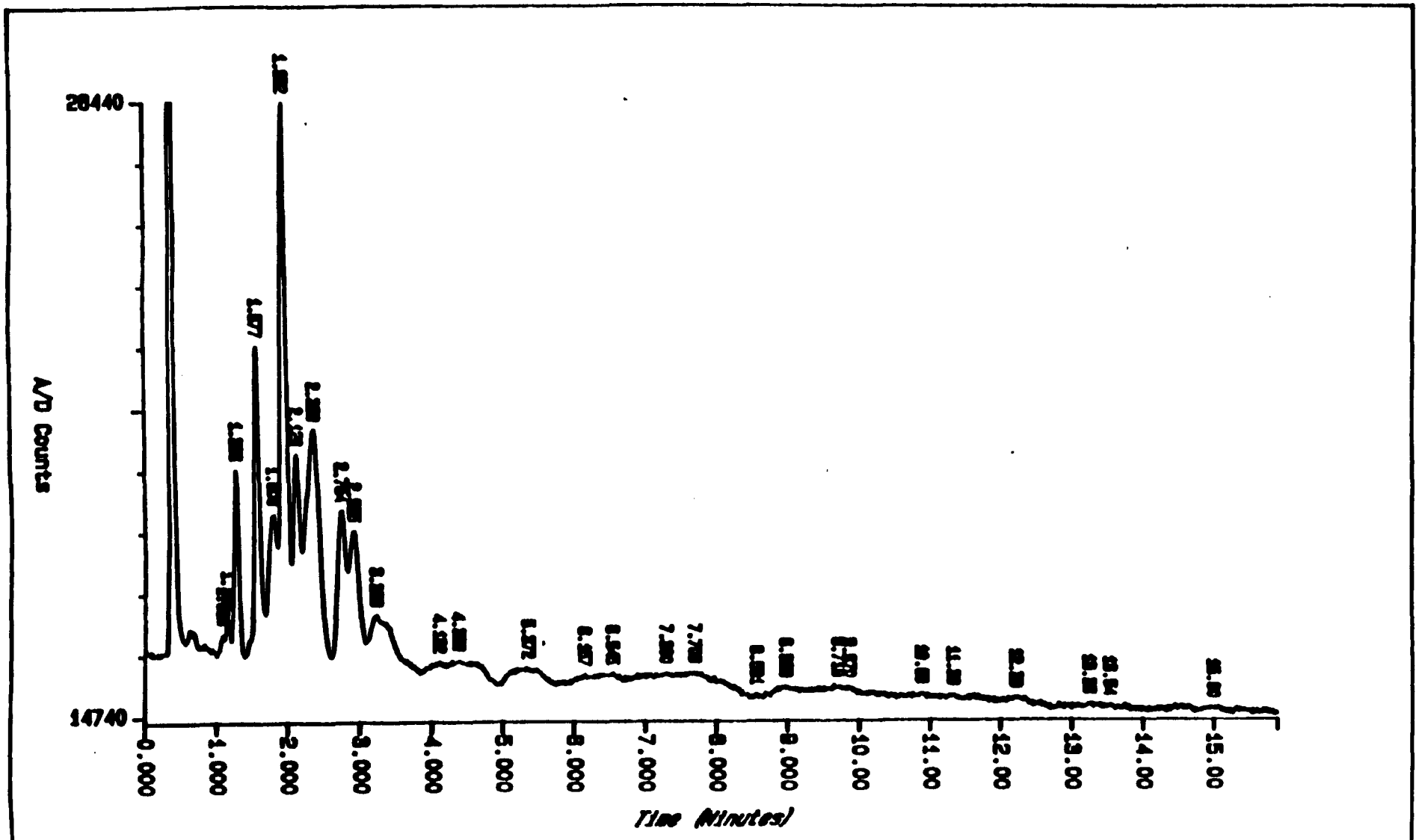
Sample: A1248 STD5.0 Injected at 15:47:18 ON FEB 22, 1984
Raw File: R7730 Proc File: P7730 Method: PCB85



Sample: A1232 STD0.5 Injected at 18:15:04 ON MAR 8, 1984
Raw File: R8033 Proc File: P8033 Method: PCBB5



Sample: A1221 STD0.5 Injected at 18:32:59 ON MAR 8, 1984
Raw File: R8034 Proc File: P8034 Method: PCBB5



Sample: A1018 STD0.5 Injected at 18:50:59 ON MAR 6, 1984
Raw File: R8035 Proc File: P8035 Method: PCBB5

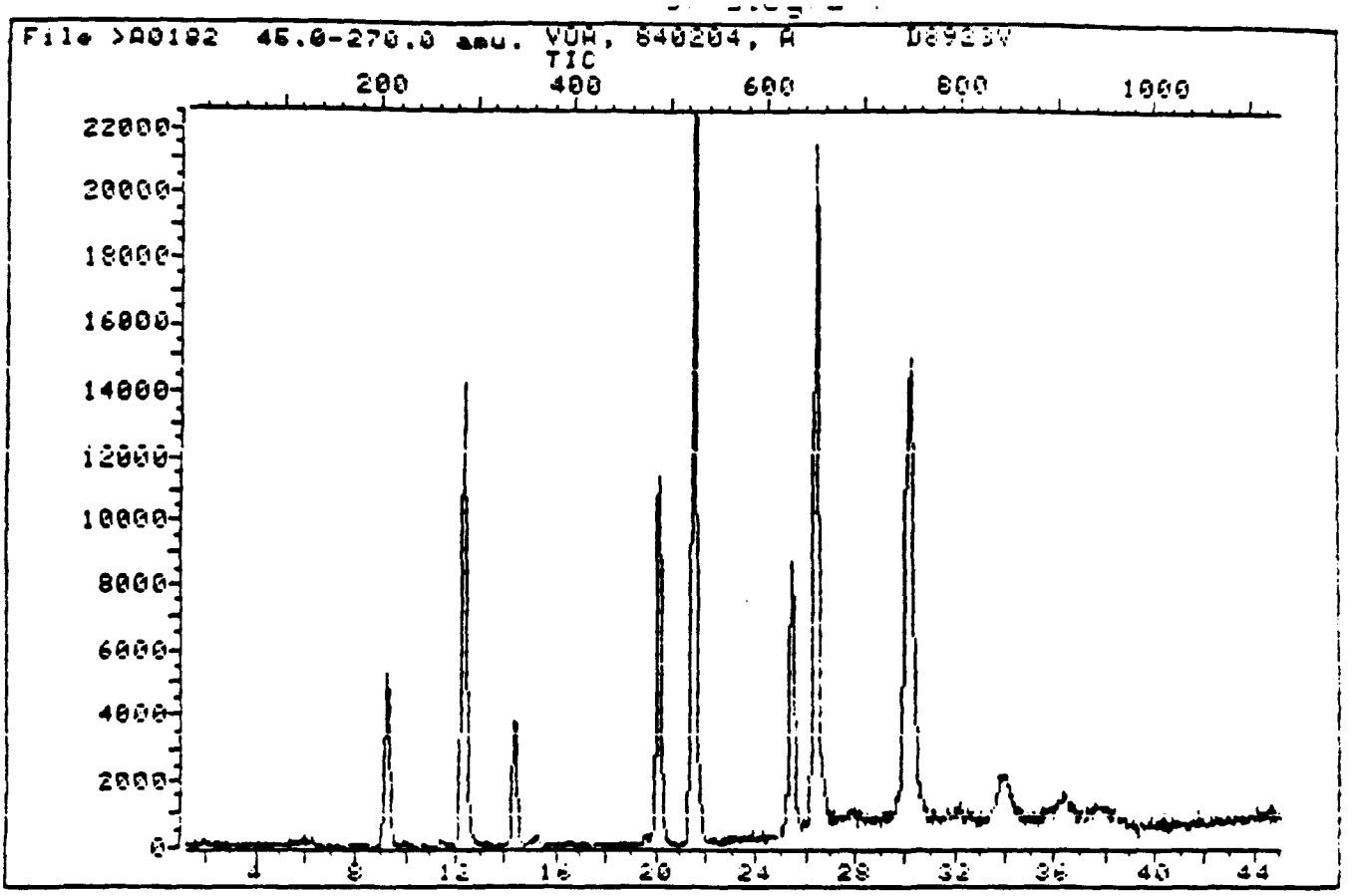
PRC 001 0331

Appendix A

Mass Spectral Data for Quantitated Compounds

1) A total ion chromatogram for each sample analysed by a GC/MS instrument

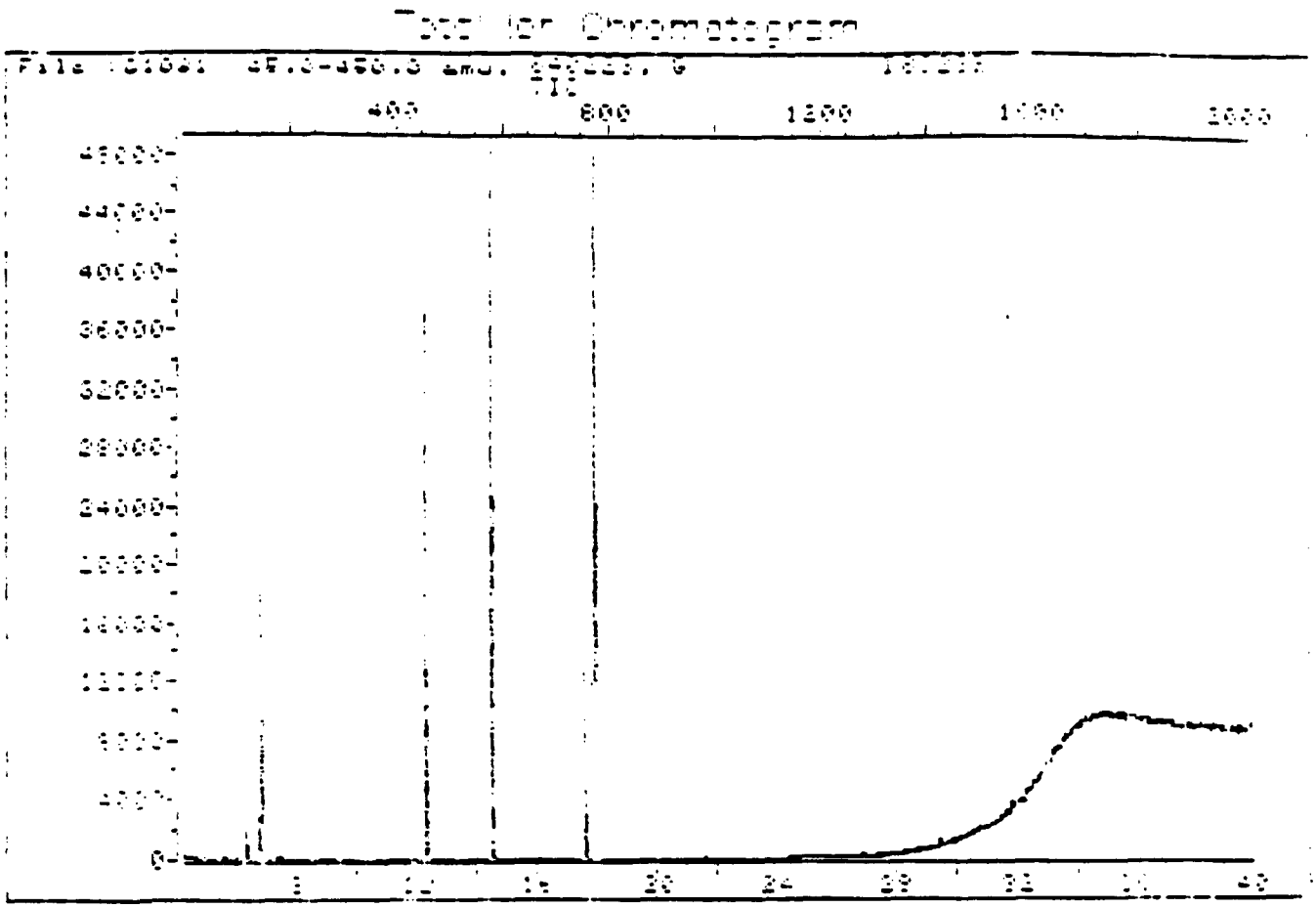
2) A mass spectrum and a reference spectrum for each priority pollutant compound detected in the sample



Data File: >A0182::U1
Name: VOA, 840204, A
Misc: D8923V

Id File: VOA
Title: DFILE, PURGEABLE PRIORITY POLLUTANTS, A
Last Calibration: 840205 00:57

Operator ID: PA0157
Qaunt Time 840205 02:44

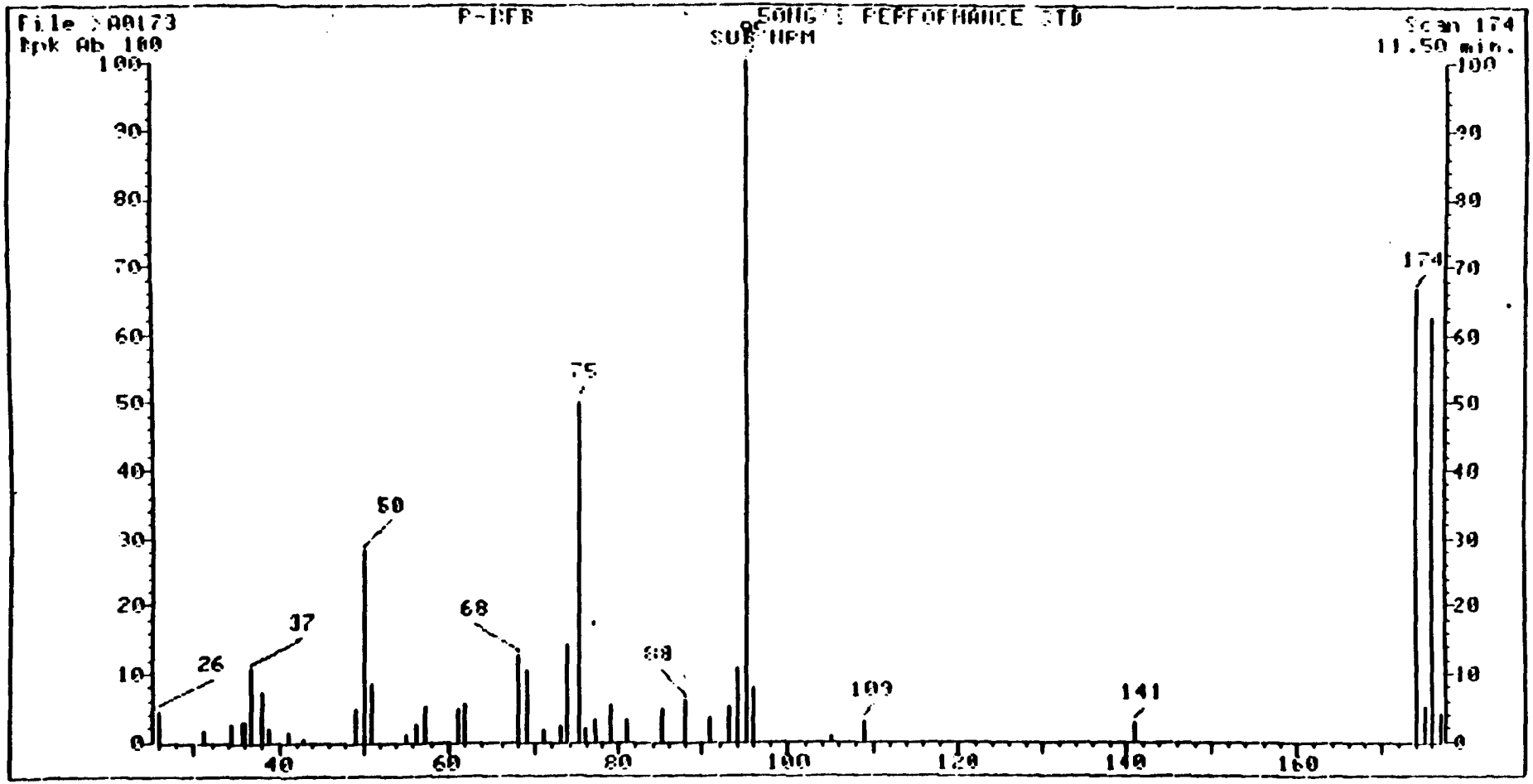

Total Ion Chromatogram
400
800
1200
1600
40000
36000
32000
28000
24000
20000
16000
12000
8000
4000
0
1
12
16
20
24
28
32
36
40

Appendix B

Mass Spectral Data for Calibration Compounds

1) If the sample analysis included the determination of purgeable organic compounds then a mass spectrum for 4-bromofluorobenzene (BFB) is included. This data was used in the instrument calibration protocol on the day of analysis.

2) If the sample analysis included the determination of non-purgeable organic compounds then a mass spectrum for decafluorotriphenylphosphine (DFTPP) is included. This data was used in the instrument calibration protocol on the day of analysis.


File :A0173
Pk Ab 100
P-DFB
SUB-HPM
Scan 174
11.50 min.
100
90
80
70
60
50
40
30
20
10
0
26
37
50
68
75
88
103
141
174
40
60
80
100
120
140
160

>A0173 P-BFB SONG'S PERFORMANCE STD
174 SUB NRM

ile: >A0173 Scan #: 174 Retn. time 11.50

m/z	Int.	m/z	Int.	m/z	Int.	m/z	Int	m/z	Int
26.00	4.40	43.05	.26	68.05	12.52	78.95	5.35	96.05	7.86
31.00	1.30	49.05	4.75	69.05	10.45	81.05	3.02	105.00	.60
34.55	2.42	49.95	27.98	71.05	1.38	85.15	4.75	109.00	2.76
35.75	2.76	51.05	8.29	73.05	1.99	88.05	5.87	141.10	2.47
35.95	2.76	55.05	.78	73.95	14.16	91.05	3.28	173.95	66.58
36.85	10.62	56.05	2.33	75.05	49.91	93.05	4.84	174.95	5.01
37.95	7.08	57.05	4.92	75.95	1.73	94.05	10.54	175.95	62.35
38.85	1.90	61.05	4.75	77.05	2.94	95.05	100.00	176.95	4.06
40.95	1.21	61.95	5.18						

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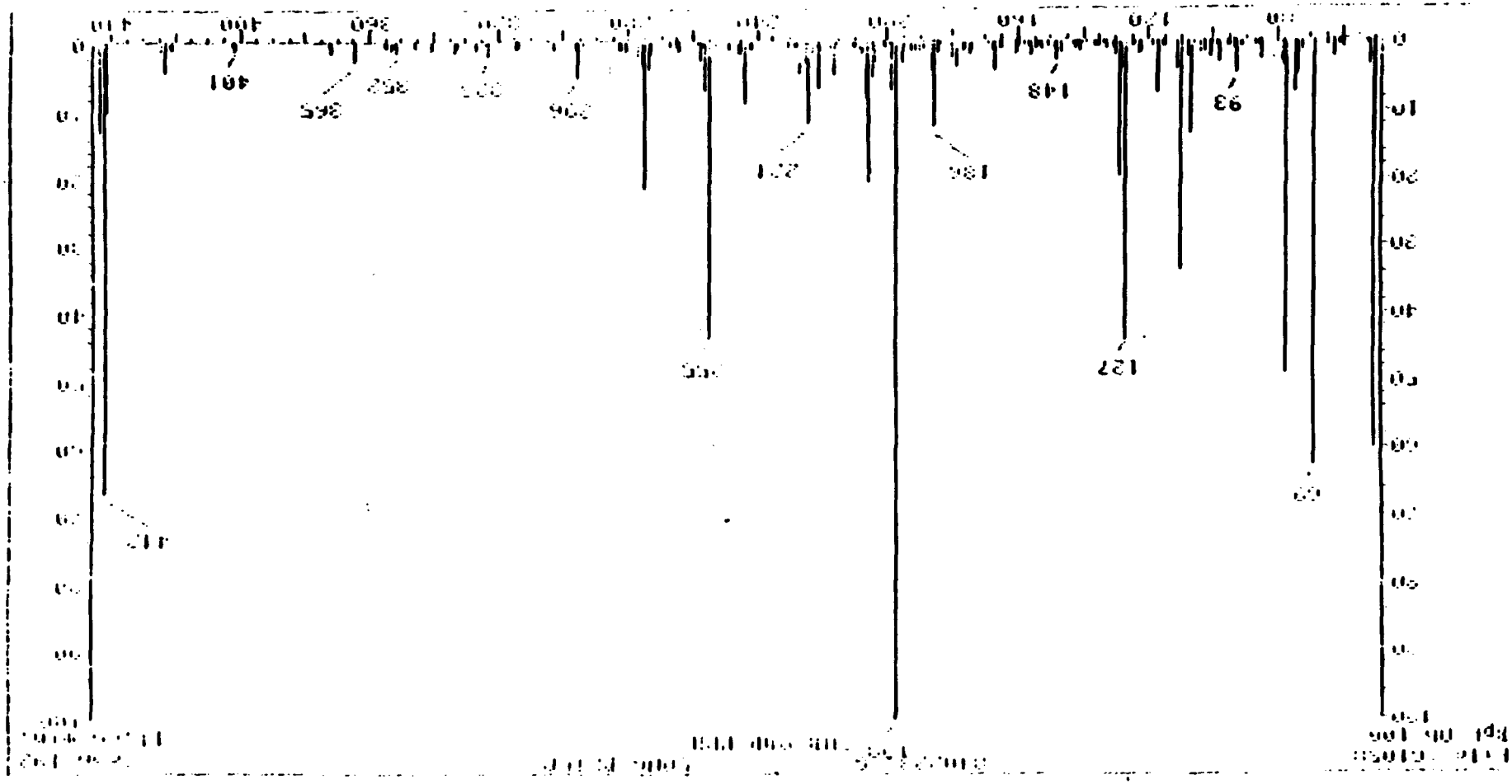

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192 [illegible] ADI [illegible]
Terminal set to [illegible]
[illegible]
[illegible] File: [illegible] Scan # [illegible]

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49.95	15.75	110.00	[illegible]	157.90	.27	209.95	.42	[illegible]	[illegible]
50.95	59.87	111.00	3.81	159.80	.40	210.45	.67	[illegible]	[illegible]
51.95	3.41	115.00	.36	160.80	1.40	211.15	.61	[illegible]	[illegible]
52.95	.23	115.80	.55	165.00	.92	215.95	.31	302.70	[illegible]
53.25	.36	116.90	7.07	165.80	.73	216.75	4.62	302.90	[illegible]
60.05	.77	117.70	.31	166.90	2.95	217.05	.67	313.80	[illegible]
60.85	.44	119.00	.38	167.90	1.17	220.95	6.41	314.60	[illegible]
61.85	.39	122.00	1.07	169.00	.25	221.95	.44	314.80	[illegible]
63.05	2.20	122.90	1.44	174.00	.82	222.85	1.55	[illegible]	[illegible]
64.95	.54	124.10	.15	175.00	1.51	224.05	[illegible]	[illegible]	[illegible]
65.95	62.54	125.00	[illegible]	176.00	.73	225.15	[illegible]	[illegible]	[illegible]
[illegible]	1.92	127.00	43.65	[illegible]	1.23	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
77.05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
77.85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
86.85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
91.05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
92.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	384.85	[illegible]
[illegible]	.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
94.85	.42	[illegible]	[illegible]	197.85	100.00	[illegible]	[illegible]	[illegible]	[illegible]
95.15	.57	[illegible]	[illegible]	198.85	7.07	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2.78	[illegible]	[illegible]	[illegible]	.42	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
100.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	274.80	21.44	[illegible]	[illegible]
102.75	[illegible]	[illegible]	[illegible]	[illegible]	5.09	[illegible]	[illegible]	[illegible]	[illegible]
103.85	1.46	[illegible]	.56	[illegible]	20.28	276.90	[illegible]	441.10	[illegible]
105.05	.96	155.00	.71	[illegible]	8.18	280.80	1.13	442.00	[illegible]
106.05	.11	155.90	1.72	207.85	1.49	281.80	.80	443.00	12.96
106.85	13.20	156.90	.36	[illegible]	.73	282.80	.69	444.10	[illegible]
108.05	2.05								

[illegible],3 Move cursor; then press carriage return :

FRC 001 0339

Appendix D
Subcontractor's Data

1) A copy of the originating subcontractor's report is included for all data not generated within ETC's laboratory.

RECEIVED FEB 8 1984

CHYUN ASSOCIATES
Architectural, Engineering & Laboratory

1101 State Road, Building B
Princeton, New Jersey 08540
609-924-5151

LABORATORY ANALYSIS REPORT

Client: ETC Corporation
Address: 284 Raritan Center Parkway
Edison, New Jersey 08837

Attention: Mr. R. Smith

Test Number: L84055
Date Received: January 31, 1984
Date Sampled: Unknown

Job Number: 03001-22F

SAMPLE NUMBER	SAMPLE DESIGNATION DESCRIPTION
1	D3907
2	D8923
DL	Detection Limit

SAMPLE NUMBER

PARAMETER/CONSTITUENT	1	2	DL			
Chemical Oxygen Demand	4	3	2			
Sulfates	15	13	2			

All results in mg/l (ppm) except where noted. Page 3 of 4 Laboratory ID No. 11198

February 3, 1984
Date

Michael Wright
Laboratory Supervisor

Appendix E

Chain-of Custody Forms

1) A field Chain-of-Custody form (COC) is included for all samples shipped by ETC shuttle.

2) An in-house sample Chain-of Custody form is included for the period the sample was in ETC's possession.

3) A subcontractor's Chain-of-Custody form is included for any analytical work not performed within ETC's laboratory.

4) Any additional Chain-of-Custody material provided by a client or by a client's sampling agent is also included.

ETC ENVIRONMENTAL TESTING AND CERTIFICATION

CHAIN OF CUSTODY FORM (CC1)

ETC Sample #: 18923
Sent Date: 1/24/84
Sampled By: [illegible]

SHIP TO:

Company: Hooker - Ruco
Facility/Site: New South Rd
Address: Hicksville, NY 11802
Attn: Robert LaMonica
Phone: ( ) -

SAMPLE IDENTIFICATION

Facility/Site Code: W|0|H|H|I|C|K|S| |

Source Codes: Well — (W); Soil — (S); Runoff — (O); River/Stream — (R); Bottom Sediment — (B); Groundwater Point — (G); Surface Impoundment — (I); Pretreatment Facility — (P); Leachate Collection Sys. — (C); Lake/Ocean — (L); Treatment Facility — (T); Other — (X)

Source Code (from above)	Your Sample Point ID (left justify)	Start Date (mo/day/yr)	Start Time (2400 hr. clock)	Duration (composite)
W	1|3|7|A|1|0|0|1|4|1	0|1|3|0|8|4	1|5|3|0	1|1
Example: W	1|0|1|J|2|6|3|P|1	0|5|1|5|8|1	0|9|3|0	1|3|

SHUTTLE CONTENTS

Sample Bottle	Condition	Sample Bottle	Condition
D8923 E1 ✓	SAMPLE NOT FILTERED	D8923 V3 ✓	Per WOH methodology
D8923 E2 ✓	ANALYZE AS PER FULL WOH RFP	D8923 V4 ✓	
D8923 E3 ✓	All samples taken Hand pump except VOAs (Chilled)	D8923 A1 ✓	
D8923 E4 ✓		D8923 B1 ✓	
D8923 V1 ✓		Rec'd ONE - 40 ml triplblank	
D8923 V2 ✓			

189
12

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) Robert Lamonica — Date: 01/30/84 — Time: 14:46
   Signature: Robert Lamonica — Seal #: 001867 7 — Intact: YES
2. I have received these materials in good condition from the above person.
   Name: — Signature:
   Date: — Time: — Remarks:
3. I have received these materials in good condition from the above person.
   Name: — Signature:
   Date: — Time: — Remarks:
4. I have received these materials in good condition from the above person.
   Name: — Signature:
   Date: — Time: — Remarks:
5. Shuttle Sealed By: (print) Robert Lamonica — Date: 01/30/84 — Time: 15:53
   Signature: Robert Lamonica — Seal #: 001867 8

ETC USE ONLY — Opened By: G. Morrison — Date: 1/31/84 — Time: 9:50 am
Seal #: 18678 — Condition: Seal intact

HRC 001 0343

ETC ENVIRONMENTAL TESTING AND CERTIFICATION

D8903
ETC Sample No.

SAMPLE POINT INFORMATION FORM (CC2)

FIELD MEASUREMENT DATA

Select up to 3 parameters to be recorded by entering the appropriate code letter in the first column for each of the 3 data entry fields provided. Enter the actual measurement data (in the units specified) for the three parameters you have selected.

PARAMETER	ACTUAL (Unit Specify)	SAMPLE
Flow (GPM)		
Velocity (Ft/s)		
Sample Depth (Ft)		
Depth to Water (Ft)		
Discharge Rate (GPM)		
Depth to Bottom (Ft)		
Total Time (0.00 hr Basis)		
Depth to Bottom (Ft)		

FIELD TEST DATA

DO (mg/L) _____ Sample Temp (°C) _____

pH _____ (Single Measurement) _____ (2nd of Duplicate) _____ (3rd of Duplicate) _____ (4th of Duplicate)

Specific Conductance (umhos/cm) _____ (Single Measurement) _____ (2nd of Duplicate) _____ (3rd of Duplicate) _____ (4th of Duplicate)

THE FOLLOWING DATA IS FOR YOUR RECORDS ONLY

SAMPLING METHOD (choose one)

AIR-LIFT PUMP ( )
AUGER ( )
BAILER ( )
BOTTLE ( )
BOURAIN ( )
DIPPER ( )
EDUCTOR ( )
HAND ( )
PERISTALTIC PUMP ( )
PETROS DI ( )
PISTON PUMP ( )
SCOOP/SHOVEL ( )
SUBJECT PUMP ( )
SUBMERSIBLE PUMP ( )
SUCTION LIFT PUMP ( )
SURGE ( )
TRENCH ( )
TUBE ( )
VOLUMETRIC ( )
OTHER _____

SAMPLE TYPE (choose one)

GRAB ( ) COMPOSITE ( ) OTHER ( )

_____ _____
(Describe) (Describe)

WEATHER SAMPLE DESCRIPTION (e.g., color, odor)

_____ _____
_____ _____
_____ _____
(Describe) (Describe)

Form Prepared By: _____ Employer: _____
Name (print)

FRC 001 0344

ETC ENVIRONMENTAL TESTING and CERTIFICATION

3959

Request for Analysis

Name of Subcontractor: Chyun

ETC Sample Number(s) D3907, D8923

Send bill to: Mr. John Birri
Send report to: Mr. R. F. Smith

ETC Corporation
284 Raritan Center Pkw.
Edison, NJ 08837
(201) 225-5600

Date Data Required: 2/11/84
If deadline cannot be met, contact R. F. Smith immediately.

Please perform the analyses requested below:

- ___ Color
- ___ Conductance, Specific
- ___ Odor
- ___ pH
- ___ Turbidity
- ___ Total Solids
- ___ Total Suspended Solids
- ___ Total Dissolved Solids
- ___ Total Volatile Solids
- ___ Gross Alpha and Gross Beta*
- ___ Radium 226 if Gross Alpha exceeds 5 pCi/l
- ___ Radium 228 if Radium 226 exceeds 3 pCi/l
- ___ Coliform, Total
- ___ Coliform, Fecal
- ___ Biological Oxygen Demand (5 day, 20 degree C)
- ✓ Chemical Oxygen Demand (COD)
- ___ Oil & Grease (Gravimetric)
- ___ Petroleum Hydrocarbons (Infrared)
- ___ Organic Carbon, Total (TOC)
- ___ Phenols, Total (as Phenolics)
- ___ Methylene Blue Active Substances (MBAS) (Foaming Agents, Surfactants)

* If Gross Alpha exceeds 5 pCi/l, R. F. Smith must be notified immediately.

- ___ Acidity
- ___ Alkalinity
- ___ Bromide
- ___ Chloride
- ___ Chlorine, Total Residual
- ___ Cyanide, Total
- ___ Ammonia (as N)
- ___ Total Kjeldahl Nitrogen (TKN)
- ___ Nitrate
- ___ Nitrate-Nitrite
- ___ Nitrite
- ___ Oxygen, Dissolved
- ___ Phosphorous, Ortho Phosphate
- ___ Silica, Dissolved
- ✓ Sulfate (as SO_4)
- ___ Sulfide (as S)
- ___ Sulfite (as SO_3)
- ___ Fluoride

OTHERS

Sample(s) Relinquished by: Greg Morris

Date 1/31/84 Time 5:20 P.M.

Sample(s) Received by: [illegible]

Date 1/31/84 Time 5:20 P.M.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

3959

LABORATORY CHAIN-OF-CUSTODY CHRONICLE

ETC Sample Number(s) D8923

Sample Preparation For:	Analyst	Date
Base/Neutral/PCB's & Pesticides	A. Nicfiaccio	2/21/84
Acids		
Metals		
Others PP/BN	A. Nicfiaccio	2/21/84
Others PCB (GC)	David B. Lacy	2/21/84
Others		
Others		

Sample Analysis For	Analyst	Date
Base Neutral/Acid/Pesticides	Kenneth Kei	2/23/84
Acids		
VOA/Purgeables	R Albert	840204
Metals		
Others TOC	C. Cullenan	2/14/84
Others TOC report	Lee Ingram	2/21/84
Others Lee Ingram PP/BN/GC		2/23/84
Others		
Others		
Others		

Verified By Ken Baker

HRC 001 0346

ETC ENVIRONMENTAL TESTING and CERTIFICATION

3159

LABORATORY CHAIN-OF-CUSTODY CHRONICLE

ETC Sample Number(s) D3907, D8923

Sample Preparation For	Analyst	Date
Base/Neutral/PCB's & Pesticides		
Acids		
Metals	[signature]	1/31/84
Others		
Others		
Others		
Others		

Sample Analysis For	Analyst	Date
Base/Neutral/PCB's & Pesticides		
Acids		
VOA/Purgeables		
Metals	[signature]	2/25/84
Others		
Others		
Others		
Others		
Others		
Others		

Verified By Ken Baker

HRC 001 0347

APPENDIX B-3

Site E - Special Samples

Occidental Chemical Corporation

Research Center

MEMO

To R. Badger Date July 15, 1983

From N. Simon

Subject GC/MS ANALYSIS OF C3588 FOR AROCLORS & PHTHALATES

COPIES: R. Schuttler, M. Kargatis, D. Thielen, A. Weston, TIC

I. SUMMARY

Fractions of the sample contained Aroclor 1248, bis(2-ethylhexyl)phthalate, di-N-butylphthalate and other unidentified phthalates. Very approximate estimates of the concentrations show Aroclor 1248 present at greater than 100 ug/g and the two identified phthalates at 1-3 mg/g.

II. EXPERIMENTAL

A). Sample Preparation

Aliquots of the sample were weighed into a 40 ml hypo-vial and diluted approximately 50:1 with methylene chloride. Each dilution or extract was shaken vigorously by hand for five minutes and then sonificated for ten minutes. The hypo-vials were inverted and 1 ul of each extract analyzed by GC/MS.

B). Instrumental Parameters

Gas Chromatographic Conditions (Finnigan 9610)

Column	- 15 m DB5-NB fused silica capillary (J&W)
Injection	- Grob, 60/1 split after 48 secs.
Carrier	- Helium 14.5 psi
Injector Temp.	- 280°C
Detector Temp.	- 280°C
GC/MS Interface	- 280°C
Column Program	- 10° to 280° at 12°/min. after a 1 min. hold at 10°, hold at 280° for 20 min.

Mass Spectrometer Conditions (Finnigan 4000)

Instrument	- Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	- 85°, Electron Impact Source with 70 eV ionizing electrons, ionizer temp. 270°C.
EM Volts	- 1080
Scan Parameters	- MID for Aroclors on six ions 2 each representing Cl_3, Cl_4, Cl_5 for phthalates data acquisition in .45 sec. with .5 sec. hold. Scan 140-350
	(MID descriptor shown in Figure 1)

(C). Standard Preparation

Bis(2-ethylhexyl)phthalate, di-n-butylphthalate and Aroclor 1254 were prepared by weighing pure standards in methylene chloride. Aroclors 1242, 1248, 1232, were obtained in solution from Supelco. Dilutions were made in methylene chloride.

III. RESULTS AND DISCUSSION

Aliquots of the sample representing soil and water, oil (or other organics) and water, and water alone were extracted with methylene chloride. An analysis of the extracts showed that the PCBs present are from Aroclor 1248. Figures 2, 3 and 4 compare a soil/water extract to Aroclors 1242, 1248 and 1254. An estimate of the concentration of Aroclor 1248 was made based on two concentration levels of a standard. The calculation was based on the sum of the trichlorobiphenyl isomers. It should be noted that the extracts analyzed represented mixtures of soil or oil and water. The water alone did not contain a detectable concentration of Aroclor 1248 (ND_{50} ug/g). The water present could have diluted the Aroclor in the soil or oil.

Sample	Conc. of Aroclor 1248 ug/g
1 soil/water A	400
2 soil/water B	150
3 oil/water A	250
4 oil/water B	220
5 water	ND_{50}

Samples 1, 3 and 5 were also analyzed for phthalates. The two phthalates identified were quantitated based on two concentration levels of a standard. It should be noted again that the concentrations found were very approximate.

Sample		di-N-butylphthalate ug/g	bis(2-ethylhexyl)phthalate
1 soil/water	A	1000	280
3 oil/water	A	2500	2200
5 water		less than 100	ND_{75}

Other phthaltes were detected. They were not identified or quantitated. Figures 5, 6 and 7 show reconstructed ion chromatograms of samples 1, 3 and 5 on the lower trace and an ion chromatogram of m/e 149 - the most common fragment to phthalates.

Nan Simon
Associate Chemist
Central Sciences

/jb
Attachments

Figure 1

MID Descriptor for

identification of

Aroclor

MID DESC: PC
INST: FINN CALI: 0714DJ

MASS DEFECT AT 100 AMU 30 MMU
MASTER RATE 1024
TOTAL ACQU TIME 0.628 SECS
TOTAL SCAN TIME 0.700 SECS
CENT SAMP INT 0.200 MS
MASS RANGE 1 TO 1024 AMU

6.	255.576	326.597	1.000	0.700	1	80	0	1	0	POS

INT #	BEGIN MASS	END MASS	TIME REQUEST	(SECS) ACTUAL	MPW	MFW	MA	TH	BL	ION
1.	255.576	256.576	0.100	0.105	2	150	50	1	0	POS
2.	257.577	258.577	0.100	0.105	2	150	50	1	0	POS
3.	289.586	290.587	0.100	0.105	2	150	50	1	0	POS
4.	291.587	292.587	0.100	0.103	2	150	50	1	0	POS
5.	323.596	324.597	0.100	0.105	2	150	50	1	0	POS
6.	325.597	326.597	0.100	0.105	2	150	50	1	0	POS

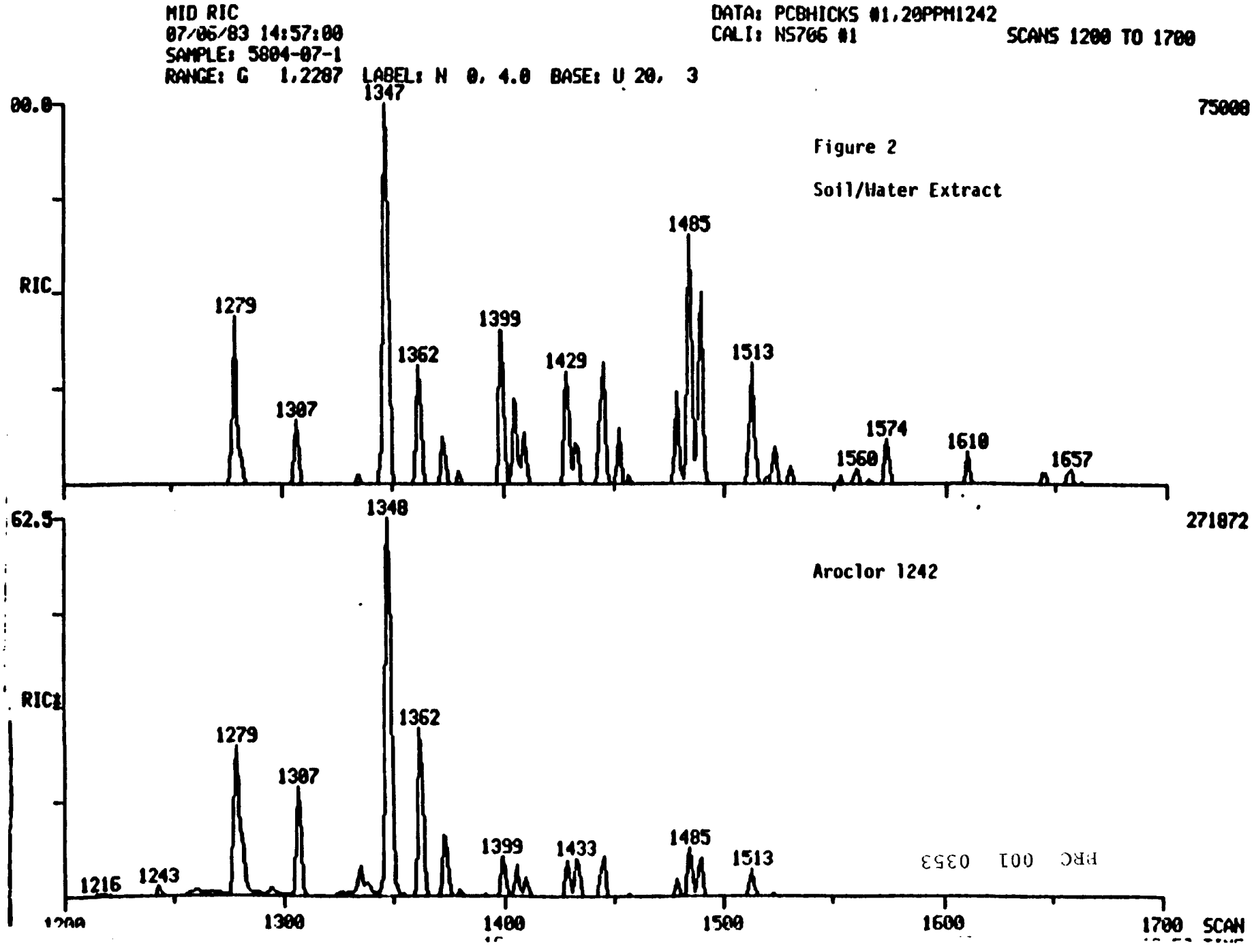
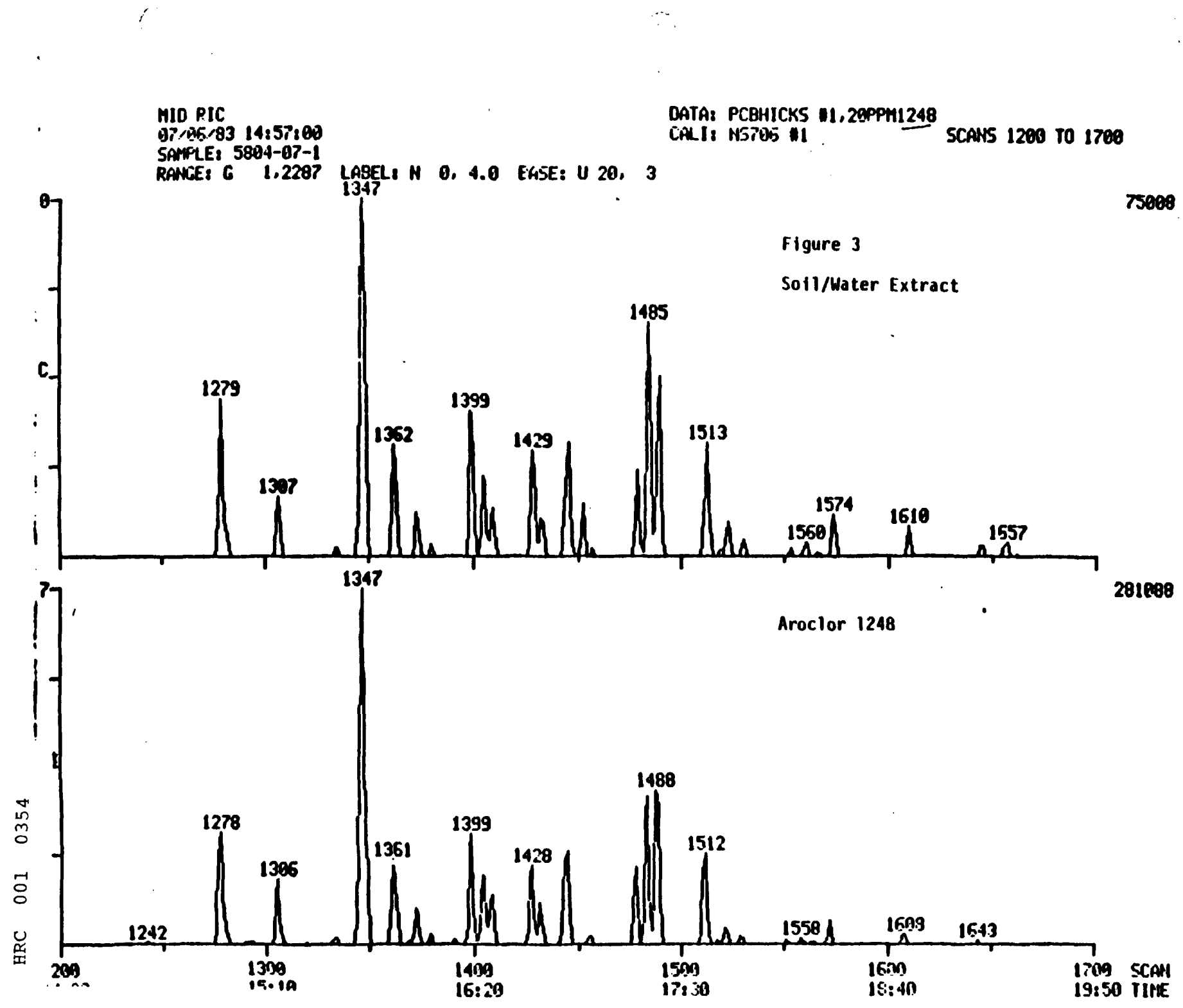


Figure 2

Soil/Water Extract


MID RIC
07/06/83 14:57:00
SAMPLE: 5804-07-1
RANGE: G 1.2287 LABEL: N 0. 4.0 BASE: U 20. 3
DATA: PCBHICKS #1,20PPM1248
CALI: NS705 #1
SCANS 1200 TO 1700
0
75000
1347
1279
1307
1362
1399
1429
1485
1513
1560
1574
1610
1557
Figure 3
Soil/Water Extract
0
281000
1347
1242
1278
1306
1361
1399
1428
1488
1512
1558
1609
1643
Aroclor 1248
200
1300
15:10
1400
16:20
1500
17:30
1600
18:40
1700 SCAN
19:50 TIME

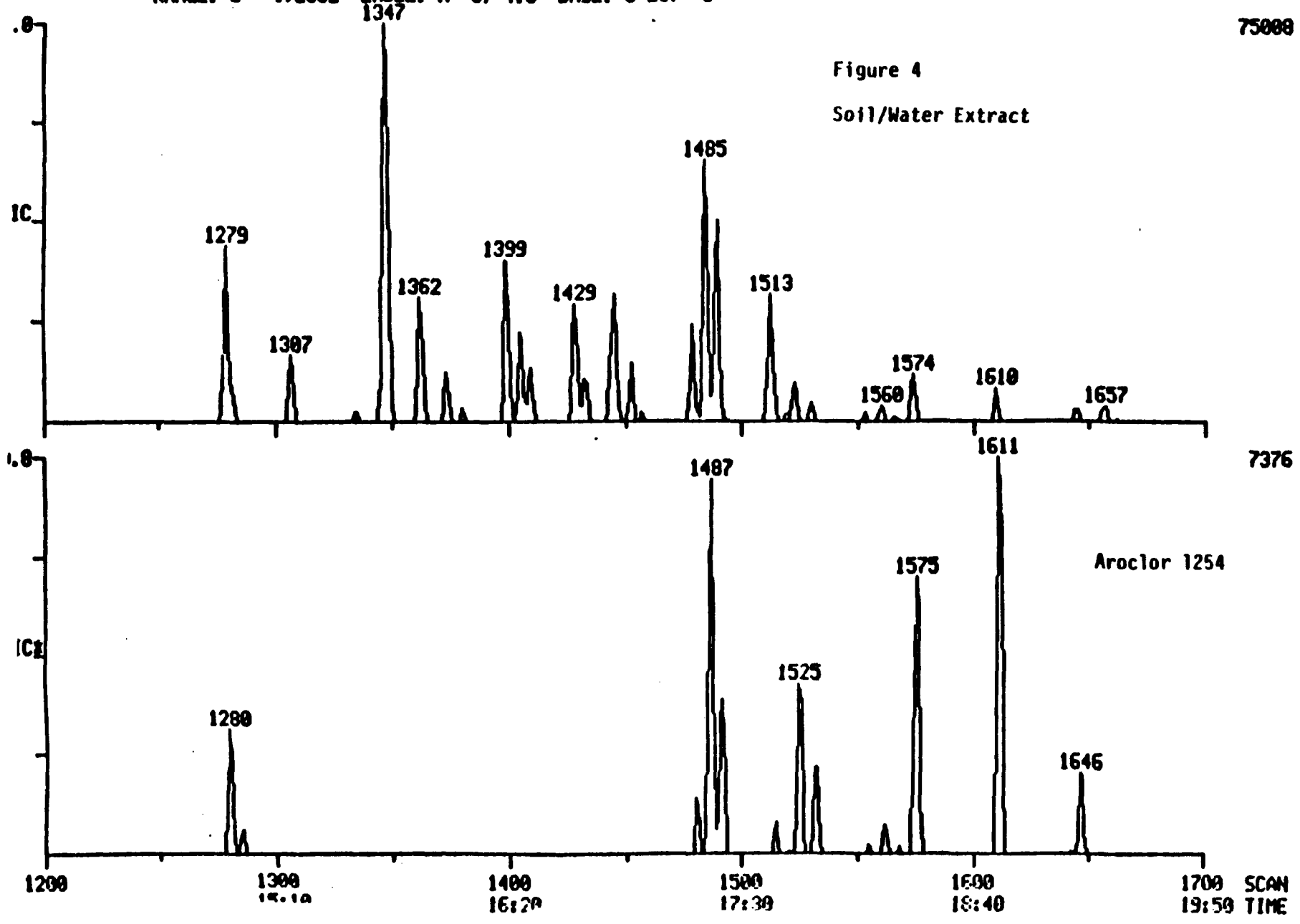


Figure 4

Soil/Water Extract

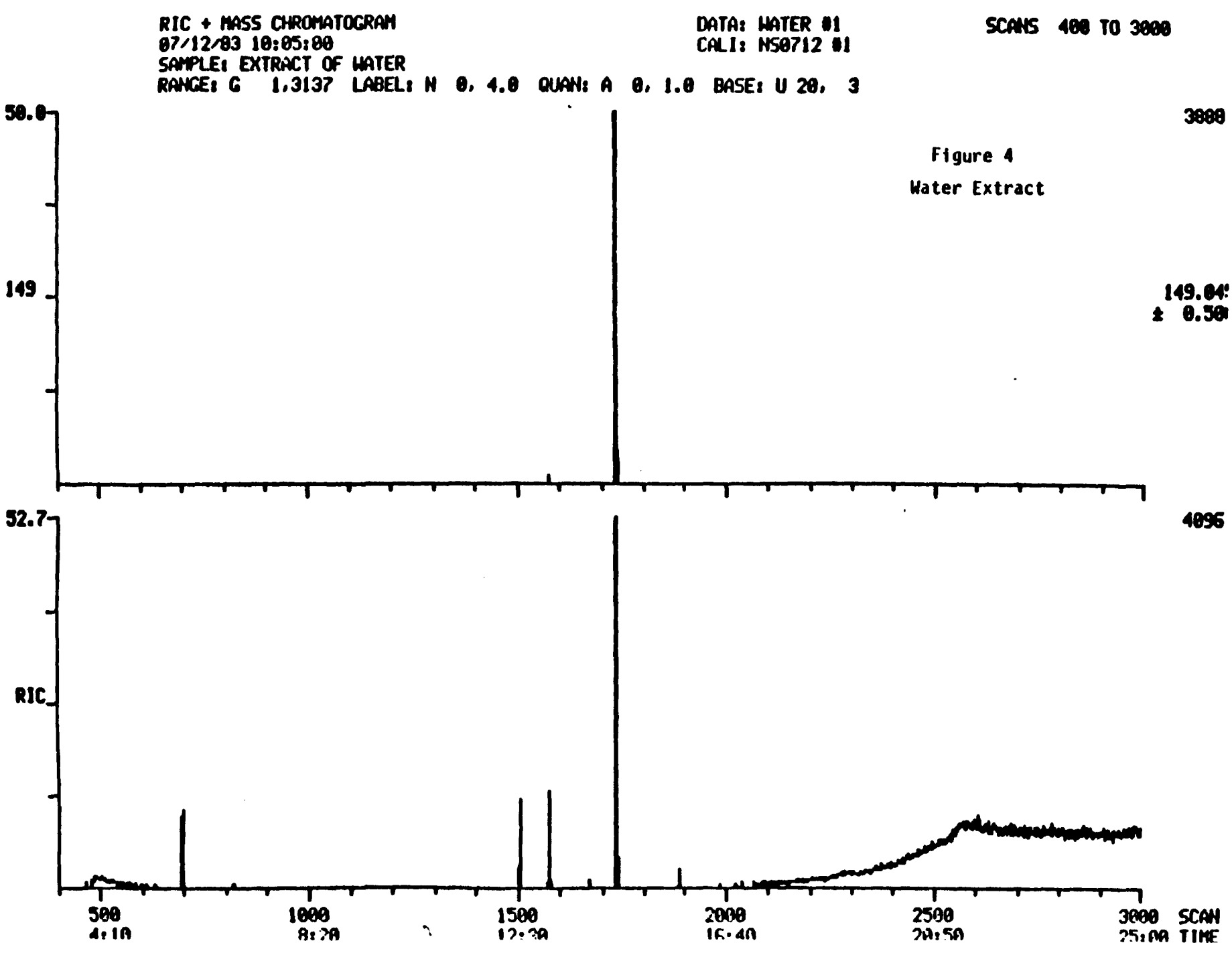


Figure 4

Water Extract

HRC 001 0356

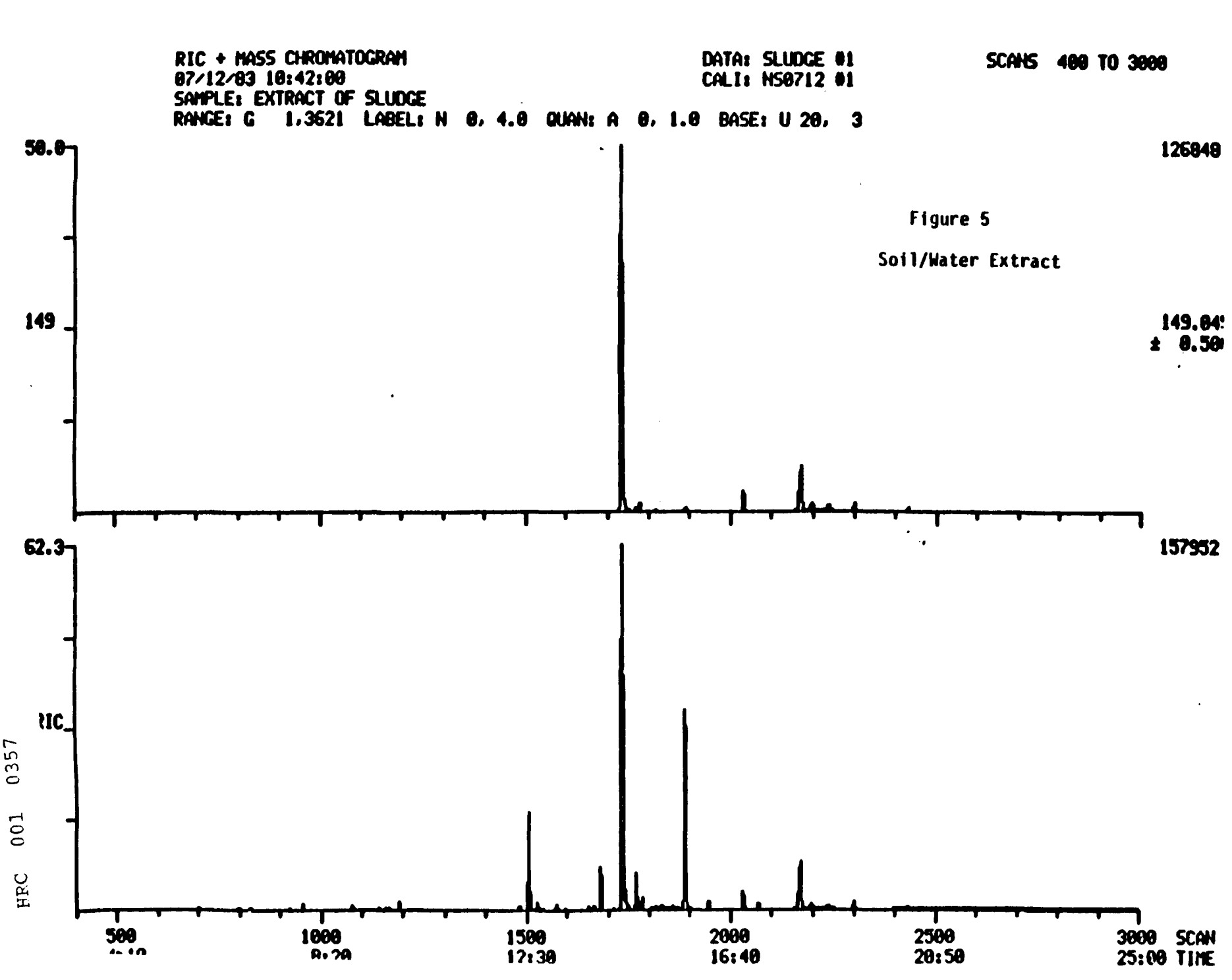


Figure 5

Soil/Water Extract

HRC 001 0357

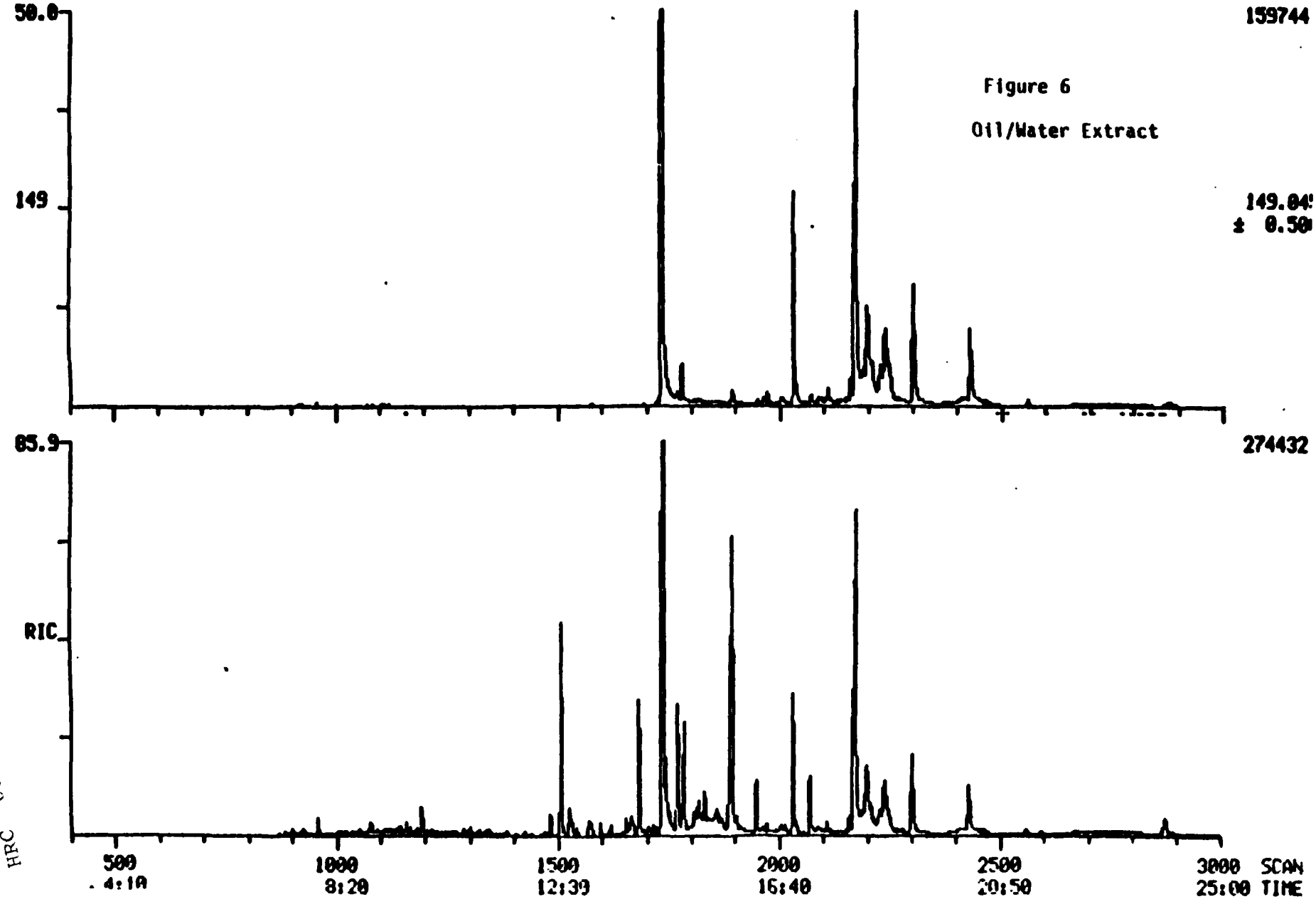


Figure 6

Oil/Water Extract

HRC 001 0358

APPENDIX B-4

COMPLETE ETC REPORTS

(Bound Separately)

A P P E N D I X I

GEOLOGIC LOGS, CONSTRUCTION DIAGRAMS AND GEOPHYSICAL LOGS

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Occidental Chemical Corp.
Ruco Pilot Plant

WELL NO. Soil Boring "W"

DATE 06/22/83 PAGE 1 OF 1 PAGES

LOCATION Hicksville, N.Y.

DATE COMPLETED June 22, 1983

DRILLING COMPANY Lauman

DRILLING METHOD Driven Cores

SAMPLING METHOD Split Spoon

SAMPLES EXAMINED BY J. Naso

REFERENCE POINT Grade (blacktop)

ELEVATION OF R.P.

WELL CONSTRUCTION
SCREEN TYPE none

DIAM. _____ SLOT NO. _____

SETTING

GRAVEL PACK SIZE

CASING none

DEVELOPMENT

PUMPING TEST
DATE

DURATION

STATIC WATER LEVEL

PUMPING WATER LEVEL

YIELD

REMARKS:

DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION
.66	.66	Asphalt and trap rock base.
.66	1.0	Hand gathered sample (013WS001A1):
		Sand, medium to very coarse, with some fine;
		pebbles; black to dark gray; strong odor.
1.0	2.5	Split spoon (014WS002A1): 8-inch
		Upper .33 foot: silty clay, black, odor.
		Lower .33 foot: sand, medium to very coarse,
		with fine; odor.
2.5	4.0	Split spoon (015WS004A1):
		Sand, medium to very coarse, with fine;
		pebbles; brown to tan; very slight odor.
4.0	5.5	Split spoon (016WS005A1):
		Sand, coarse to very coarse, with medium.
		Boring filled with clay, with broken
		asphalt on top.

EPC 001 0361

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Soil Boring W Replacement

DATE 2/17/84 PAGE 1 OF 1 PAGES

LOCATION: Southwest corner of the Pilot Plant

DATE COMPLETED: November 28, 1983

DRILLING COMPANY: R. H. Lauman and Associates, Inc.

DRILLING METHOD: Hand auger

SAMPLING METHOD: Split spoon

SAMPLES EXAMINED BY: C. Fricke

REFERENCE POINT: Grade

ELEVATION OF R.P.: Approx. 130 ft. above MSL

WELL CONSTRUCTION
SCREEN TYPE: None
DIAM. _____ SLOT NO. _____
SETTING _____
GRAVEL PACK SIZE _____
CASING _____
DEVELOPMENT _____

PUMPING TEST
DATE _____
DURATION _____
STATIC WATER LEVEL _____
PUMPING WATER LEVEL _____
YIELD _____

REMARKS: _____

DEPTH IN FEET FROM	TO	DESCRIPTION
0	0.2	Blacktop.
0.2	0.5	Gray sandy soil and fill.
0.5	1.0	Sandy soil, grayish black (fill), gravel and cobbles; oily sheen. Obtained sample by hand. S 128WS001A1 C 5513.
1.0	2.5	Top: Clayey soil, brown; with fine to medium gravel. Bottom: Sand, fine, tan and fine gravel; some cobbles. Black ring of oily material. S 129WS002A1 C 5514.
2.5	4.0	Sand, fine to medium, tan; fine gravel; some brown silt. S 130WS004A1 C 5515.
4.0	5.5	Sand, fine, some medium, tan; some cobbles and coarse gravel; little orange sand (iron oxide). S 131WS005A1 C 5516.
5.5	7.0	Sand, fine to medium, tan, and medium gravel; some cobbles. S 132WS007A1 C 5517.
7.0	8.5	Sand, fine to medium, tan to rust; some fine to medium gravel. S 133WS008A1 D 5493.
8.5	10.0	Sand, coarse to medium, some fine, orangish brown; some very fine to fine gravel; trace of red sand. S 134WS010A1 D 5494.
		Test boring backfilled and capped with cement

HRC 001 0362

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Occident Chemical Corp.
Ruco Pilot Plant

WELL NO. Soil Boring "X"

DATE 06/22/83 PAGE 1 OF 1 PAGES

LOCATION Hicksville, N.Y.

DATE COMPLETED June 22, 1983

DRILLING COMPANY Lauman

DRILLING METHOD Driven Cores

SAMPLING METHOD Split Spoon

SAMPLES EXAMINED BY R. Lamonica & J. Naso

REFERENCE POINT Grade (blacktop)

ELEVATION OF R.P.

WELL CONSTRUCTION
SCREEN TYPE none

DIAM. SLOT NO.

SETTING

GRAVEL PACK SIZE

CASING none

DEVELOPMENT

PUMPING TEST
DATE

DURATION

STATIC WATER LEVEL

PUMPING WATER LEVEL

YIELD

REMARKS:

DEPTH IN FEET FROM	TO	DESCRIPTION
0	0.5	Asphalt and trap rock base.
0.5	1.0	Hand gathered sample (009XS001A1):
		Sand; silt; stones; stained black; oily;
		strong odor.
1.0	2.5	Split spoon (010XS002A1): 12-inch return
		Upper .33 foot: sand; stones; silt; black;
		strong odor.
		Middle .33 foot: silt; gray-brown; no odor.
		Bottom .33 foot: sand, fine to coarse;
		stones; tan; slight odor.
2.5	4.0	Split spoon (011XS004A1):
		Sand, medium to very coarse, with some
		fine; tan; slight odor.
4.0	6.0	Split spoon (012XS005A1):
		Sand, medium to very coarse, with some
		fine; pebbles; tan.
		End of boring, filled with clay with broken
		asphalt on top.

HRC 001 0363

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Soil Boring X Replacement

DATE 2/17/84 PAGE 1 OF 1 PAGES

LOCATION: Southwest corner of the Pilot Plant

DATE COMPLETED: November 23, 1983

DRILLING COMPANY: R. H. Lauman and Associates, Inc.

DRILLING METHOD: Hand auger - cable tool

SAMPLING METHOD: Split spoon

SAMPLES EXAMINED BY: C. Fricke

REFERENCE POINT: Grade

ELEVATION OF R.P.: Approx. 130 ft. above MSL

WELL CONSTRUCTION
SCREEN TYPE: None
DIAM. ____ SLOT NO. ____
SETTING ____
GRAVEL PACK SIZE ____
CASING ____
DEVELOPMENT ____

PUMPING TEST
DATE ____
DURATION ____
STATIC WATER LEVEL ____
PUMPING WATER LEVEL ____
YIELD ____

REMARKS: Test boring backfilled and capped with cement.

DEPTH IN FEET FROM	TO	DESCRIPTION
0	0.5	Blacktop and traprock base.
0.5	1.0	Black, tarry fill; strong odor. Obtained a sample by hand. S 121XS001A1 D 5475.
1.0	2.5	0 - .5 Brown soil with some gravel grading to black, tarry soil (sheen); strong odor. S 122XS002A1 D 5476.
2.5	4.0	Sand, very fine to very coarse, tan; some black tarry sand; little tan silt; gravel, fine to medium; mild odor. S 123XS004A1 D 5477.
4.0	5.5	Sand, very fine to fine, tan; some fine gravel and silt; slight odor. S 124XS005A1 D 5478.
5.5	7.0	Sand; fine to medium, tan with fine gravel. S 125XS007A1 D 5479.
		NOTE: Hand auger no longer effective due to caving. Drove 8-inch casing to 7 ft. and cleaned it out.
7.0	8.5	Sand, very fine to very coarse, tan; gravel, fine; strong odor, sheen. S 126XS008A1 D 5499.
8.5	10.0	Sand, medium, some coarse, brown and multi-colored; fine to medium gravel; trace of brown silt; strong odor, oily sheen. S 127XS010A1 D 5501.

HRC 001 0364

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Occidental Chermical Corp.
Ruco Pilot Plant

WELL NO. Soil Boiling "Y"

DATE 06/21/83 PAGE 1 OF 1 PAGES

LOCATION Hicksville, N.Y.

DATE COMPLETED June 21, 1983

DRILLING COMPANY Lauman

DRILLING METHOD Driven Cores

SAMPLING METHOD Split Spoon

SAMPLES EXAMINED BY R. Lamonica

REFERENCE POINT grade (blacktop)

ELEVATION OF R.P.

WELL CONSTRUCTION
SCREEN TYPE none

DIAM. SLOT NO.

SETTING

GRAVEL PACK SIZE

CASING none

DEVELOPMENT

PUMPING TEST
DATE

DURATION

STATIC WATER LEVEL

PUMPING WATER LEVEL

YIELD

REMARKS:

DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION
0	.75	Blacktop and trap rock subbase.
.75	2.25	Split spoon (005YS002A1):
		Sand; stones; silt; brown; somewhat
		cohesive, very slight unidentifiable odor;
		some black staining.
2.25	3.75	Split spoon (006YS004A1):
		Sand, fine to coarse; stones; trace of silt;
		tan-brown.
3.75	5.25	Split spoon (007YS005A1):
		Sand, fine to coarse; stones; trace of silt;
		tan; moist; slight stain and odor in
		middle of sample.
5.25	6.75	Split spoon (000YS006A1):
		Sand, fine to coarse; stones; dry; tan;
		non-cohesive.
		End of boring filled with clay slurry to bottom
		of broken pavement, with broken asphalt and
		stones on top.

FRC 001 0365

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Soil Boring Y Replacement

DATE 2/17/84 PAGE 1 OF 1 PAGES

LOCATION: Southwest corner of the Pilot Plant

DATE COMPLETED: November 18, 1983

DRILLING COMPANY: R. H. Lauman and Associates, Inc.

DRILLING METHOD: Hand auger - cable tool

SAMPLING METHOD: Split spoon

SAMPLES EXAMINED BY: R. Lamonica

REFERENCE POINT: Grade

ELEVATION OF R.P.: Approx. 130 ft. above MSL

WELL CONSTRUCTION
SCREEN TYPE: None
DIAM. ____ SLOT NO. ____
SETTING ____
GRAVEL PACK SIZE ____
CASING ____
DEVELOPMENT ____

PUMPING TEST
DATE ____
DURATION ____
STATIC WATER LEVEL ____
PUMPING WATER LEVEL ____
YIELD ____

REMARKS: ____

DEPTH IN FEET FROM	TO	DESCRIPTION
0	0.25	Blacktop and base.
0.25	1.0	Black-stained soil alternating with tan-gray soil (fill) consisting of stones, silt and sand.
1.0	2.5	0 - .33 Black-stained fill of stones, sand and silt; strong odor.
		0.33 - 0.66 Partially stained fill.
		0.66 - 1.0 Tan and white fill of sand and stones; strong odor. S 115YS002A1 D 5481.
2.5	4.0	Fill composed of sand, silt, gravel, stones; tan-brown; odor, no staining.
		S 116YS004A1 D 5482.
4.0	5.5	Sand, fine to medium; silt; gravel; tan; strong odor. S 117YS005A1 D 5483.
5.5	7.0	Sand, fine to medium; silt; gravel; tan; strong odor. S 118YS006A1 D 5484.
		NOTE: Hand auger no longer effective due to caving. Drove 8-inch casing to 7 feet and cleaned it out.
7.0	8.5	Sand, medium, tan, with cobbles; strong odor.
		S 119YS008A1 D 5498.
8.5	10.0	Sand, fine to medium; quartz cobbles; odor.
		S 120YS009A1 D 5489.
		Test boring backfilled and capped with cement

HRC 001 0366

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Occidental Chemical Corp.
Ruco Pilot Plant

WELL NO. Soil Boring "Z"

DATE 06/21/83 PAGE 1 OF 1 PAGES

LOCATION: Hicksville, N.Y.

DATE COMPLETED: June 21, 1983

DRILLING COMPANY: Lauman

DRILLING METHOD: Driven Cores

SAMPLING METHOD: Split Spoon

SAMPLES EXAMINED BY: R. Lamonica

REFERENCE POINT: Grade (blacktop)

ELEVATION OF R.P.:

WELL CONSTRUCTION
SCREEN TYPE: none

DIAM. _____ SLOT NO. _____

SETTING:

GRAVEL PACK SIZE:

CASING: none

DEVELOPMENT:

PUMPING TEST
DATE:

DURATION:

STATIC WATER LEVEL:

PUMPING WATER LEVEL:

YIELD:

REMARKS:

DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION
0	0.5	Blacktop and trap rock subbase.
0.5	2.0	Split spoon (001ZS002A1):
		Upper 0.33 foot: stones; silt; clay;
		non-cohesive; stained black; slight oily
		odor.
		Lower 0.66 foot stones; silt; clay; tan;
		cohesive.
		(spoon driven 1.5 feet; 1.0 feet recovery).
2.0	3.5	Split spoon (002ZS003A1):
		Sand, fine to coarse; stones rounded; trace
		of silt.
3.5	5.0	Split spoon (003ZS005A1):
		Sand, fine to coarse; stones.
5.0	6.5	Split spoon (004ZS006A1):
		Sand, fine to coarse; stones; tan.
		End of boring filled with clay slurry to bottom
		of broken pavement, with broken asphalt and
		stones on top.

HRC 001 0367

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Soil Boring Z Replacement

DATE 2/17/84 PAGE 1 OF 1 PAGES

LOCATION: Southwest corner of the Pilot Plant

DATE COMPLETED: November 17, 1983

DRILLING COMPANY: R. H. Lauman and Associates, Inc.

DRILLING METHOD: Hand auger

SAMPLING METHOD: Split spoon

SAMPLES EXAMINED BY: J. Lennox

REFERENCE POINT: Grade

ELEVATION OF R.P.: Approx. 130 ft. above MSL

WELL CONSTRUCTION
SCREEN TYPE: None
DIAM. _____ SLOT NO. _____
SETTING _____
GRAVEL PACK SIZE _____
CASING _____
DEVELOPMENT _____

PUMPING TEST
DATE _____
DURATION _____
STATIC WATER LEVEL _____
PUMPING WATER LEVEL _____
YIELD _____

REMARKS: _____

DEPTH IN FEET FROM	TO	DESCRIPTION
0	0.5	Blacktop and traprock base.
0.5	2.0	0 - .1 Sand, fine to coarse, gravel, brown.
		.1 - .4 Clayey sand, silty, black.
		.4 - .8 Sand, silty, brown; some gravel.
		.8 - Sand, coarse and some gravel.
		S 109ZS002A1 C 5434.
2.0	3.5	0 - .35 Sand, silty, gray with some black.
		.35 - .7 Coarse sand, gravel, brown.
		S 110ZS003A1 C 5435.
3.5	5.0	Sand, medium to very coarse, brown; trace of
		gravel. S 111ZS005A1 C 5436.
5.0	6.5	Sand, fine to coarse, brown; little gravel.
		S 112ZS006A1 C 5437.
		(Augered soil has strong odor at about
		6 feet.)
6.5	8.5	0 - .4 Sand, fine to coarse, brown; trace of
		gravel.
		.4 - .8 Sand, very fine to medium, and gravel.
		S 113ZS008A1 C 5438.
8.5	10.0	Sand, fine to coarse, brown; trace of gravel.
		S 114ZS009A1 D 5480.
		Test boring backfilled and capped with cement

HRC 001 0368

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Site A

DATE 08/24/83 PAGE 1 OF 3 PAGES

		DEPTH IN FEET FROM	TO	DESCRIPTION
LOCATION	North side of plant east of Tech. Service Lab	Grade	0.5	Brown soil consisting of silt and very fine sand; no odor.
DATE COMPLETED	September 2, 1983	0.5	2.5	Silt, and very fine sand, brown and subangular
DRILLING COMPANY	R. H. Lauman & Associates, Inc.			pebbles. (Split spoon).
DRILLING METHOD	Cable Tool	3	5	Pebbles and cobbles; some gravel, very coarse
SAMPLING METHOD	Split Spoon & Bailer			sand and tan clay. (Bailer sample).
SAMPLES EXAMINED BY	J. Naso R. Lamonica	5	7	Sand, very fine to coarse, tan to brown,
REFERENCE POINT	Grade 134.2 ft. above MSL			pebbles, and cobbles. (Split spoon).
ELEVATION OF R.P.	A-1 137.52 ft. MSL A-2 136.73 ft. MSL	5	10	Cobbles, pebbles, and very fine to very coarse,
WELL CONSTRUCTION SCREEN TYPE	wire-wrapped stainless steel			tan to brown sand. (Bailer sample).
DIAM. / SLOT NO.	2-inch 10	10	12	Sand, very coarse, tan, gravel and pebbles.
SETTING	A-2 105 to 112 ft.; A-1 54 to 67 ft. BGL			(Split spoon).
GRAVEL PACK SIZE	Grade 1 New Jersey*	10	15	Gravel, cobbles and very fine to very coarse,
CASING	2-inch stainless steel			tan to brown sand. (Bailer sample).
DEVELOPMENT	A-1 10 hrs. air-lift	15	17	Sand, very fine to very coarse, tan to brown,
	A-2, 3 hrs.			and gravel. (Split spoon).
PUMPING TEST	None	15	20	Gravel, cobbles and very fine to very coarse,
DATE				tan to brown sand. (Bailer sample).
DURATION				
STATIC WATER LEVEL	A-1 78.46 ft MSL A-2 78.15 ft MSL	20	22	Sand, very fine to coarse, tan to brown, and
PUMPING WATER LEVEL				gravel; some pebbles and silt. (Split
YIELD	A-1 1 gpm A-2 7 gpm			spoon).
REMARKS:	Portland cement - Deep zone: 100 to 80 feet. Shallow zone: 48 feet to grade. *Gravel pack - Deep zone: 115 to 101 feet with addition of very fine sand pack from 101 to 100 feet. Shallow zone: 48 to 80 feet.	20	25	Gravel, pebbles, cobbles, very fine to very coarse, tan to brown sand and silt. (Bailer sample).
		25	27	Sand, very fine to very coarse, tan to brown; silt and gravel; some pebbles. (Split spoon).

HRC 001 0369

DEPTH IN FEET FROM	TO	DESCRIPTION
25	30	Sand, very fine to very coarse, tan to brown; gravel and pebbles; some cobbles. (Bailer sample).
30	32	Sand, fine to medium, tan; some gravel. (Split spoon).
32	35	Sand, fine to coarse, tan; gravel, and stones; no odor. (Bailer sample
35	37	Gravel and fine to coarse tan, sand and stones. (Bailer sample).
37	41	Gravel and fine to coarse tan, sand and stones; some iron oxide; no odor. (Bailer sample).
41	43	Gravel and fine to coarse tan, sand and stones; some iron oxide; no odor. (Split spoon).
41	45	Sand, fine to medium, yellowish-tan; some gravel. (Bailer sample).
45	47	Top 6 inches: Sand, fine to medium, red and tan; trace gravel.
		Middle 6 inches: Sand, fine to medium, tan; trace gravel.
		Bottom 6 inches: Sand, fine to medium, red; trace white clay.
	.	(Split spoon).
45	50	Sand, fine to medium, multicolored with red, yellow and gray sandy clay clayey sand; few white-gray clay streaks. (Bailer sample).
50	52	Sand, fine to medium, and tan, red, yellow, white, gray, clayey sand and sandy clay. (Split spoon).
50	60	Sand, fine to medium, and tan, red, yellow, white, gray, clayey sand an sandy clay. (Bailer sample).
60	65	Sand, fine, tan and red, layers of multicolored (red, white, gray, yellow) clay, sandy clay and clayey sand; some fine gravel, trace red silt or clay.

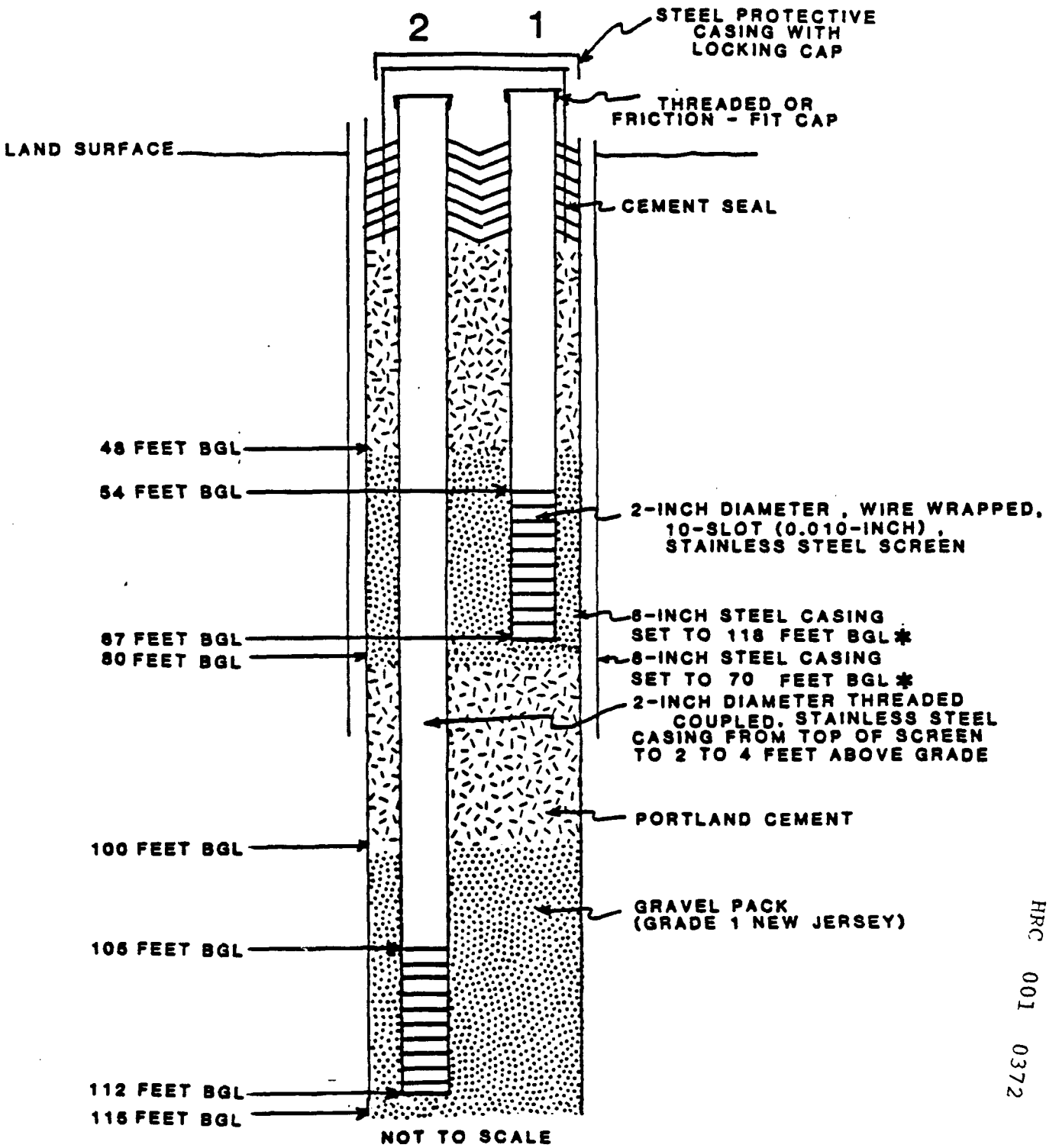
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Y

WELL NO. Site A

DEPTH IN FEET FROM	TO	DESCRIPTION
	63	Sand, fine, tan and red, layers of multicolored (red, white, gray, yellow) clay, sandy clay and clayey sand; some fine gravel, trace of red silt, clay and large fragments of conglomeratic oxidized sandstone. (Bailer sample).
65	70	Sand, fine, some medium and coarse; and streaks fine multicolored sandy clay and clayey sand; some streaks clay. (Bailer sample).
70	72	Sand, fine to medium; some yellow silt. (Bailer sample).
72	74	Sand, fine to medium, trace yellow silt.
		Bottom 1 inch: Multicolored clayey sand. (Split spoon).
77	86	Sand, fine to medium, tan; streaks multicolored (red, white, yellow) sandy clay, clayey sand and clay, and iron concreted sandstone. (Bailer sample).
87	89	Sand, fine to medium, tan; streaks white clay, sandy clay and clayey sand. (Bailer sample).
	89	2 to 3-inch layer of clay, light gray with streaks multicolored sandy clay. (Bailer sample).
90	92	Sand, fine, tan, streaks light gray clay; some mica. (Bailer sample).
92	106	Sand, fine, tan; some white, trace red clay, sandy clay and clayey sand. (Bailer sample).
106	109	Sand, fine, some medium, tan; trace white, some red silt and clay. (Bailer sample).
109	112	Sand, fine to medium, tan; trace red clay.
112	116	Sand, fine to medium, tan; trace light gray clay. (Bailer sample)
117	118	Clay, sandy clay and clayey sand, black, gray, white, red, interbedded, and stiff.
	118	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE A



*ALL CASINGS PULLED DURING WELL INSTALLATION

HRC 001 0372

LEGGETTE, BRASHEARS & GRAHAM, INC

GEOPHYSICAL WELL LOG

LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

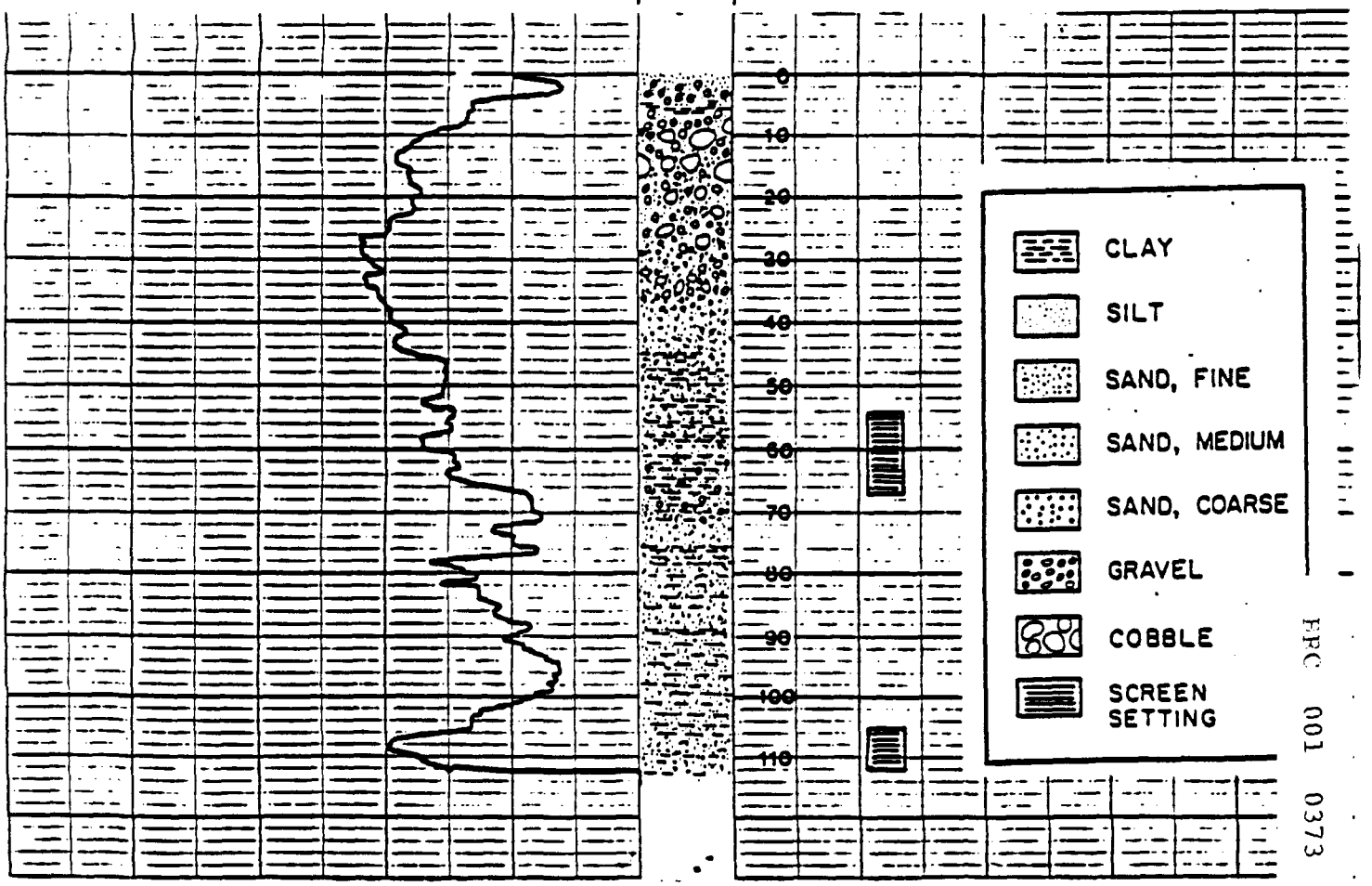
OWNER Whiteman, Osterman & Hanna
LOCATION Former OCC Ruco Division Plantsite
Hicksville, New York
WELL NO. A
DRILLING METHOD Cable Tool
DEPTH DRILLED 118 feet
DEPTH LOGGED 114 feet
DEPTH SCALE 20 feet/inch
LOGGED BY Robert Lamonica

DATE August 29, 1983
DRILLER R. H. Lauman & Associates, Inc.
REFERENCE POINT Land Surface
ELEVATION 134.2 feet above mean sea level.
CASING 8-inch to 60 feet; 6-inch to 118 feet;
HOLE DIAMETER 6-inch (inner casing)
REMARKS Static water level about 58.5 feet below grade.

GAMMA RAY

SCALE: 16 counts/second/inch
TIME CONSTANT: 3 seconds
LOGGING RATE: 25 feet/minute
Increasing Radiation

Geologist's Log



EPC 001 0373

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Site B

DATE 09/07/83 PAGE 1 OF 4 PAGES

LOCATION: Front of parking lot near road

DATE COMPLETED: September 14, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable Tool

SAMPLING METHOD: Bailer and split spoon

SAMPLES EXAMINED BY: J. Naso, R. Lamonica, C. Fricke

REFERENCE POINT: Land Surface 130.5 ft. above MSL

ELEVATION OF R.P.: B-1 132.65 ft. MSL B-2 132.64 ft. MSL

WELL CONSTRUCTION
SCREEN TYPE: wire-wrapped stainless steel
DIAM. 2-inch SLOT NO. 10
SETTING: 104-86 ft.; 69-49 ft.
GRAVEL PACK SIZE: Grade 1 New Jersey*
CASING: 2-inch stainless steel
DEVELOPMENT: B-1 24 hrs. air-lift
B-2 4 hrs. air-lift

PUMPING TEST: None
DATE
DURATION
STATIC WATER LEVEL: B-1 77.86 ft MSL B-2 77.92 ft MSL
PUMPING WATER LEVEL
YIELD: B-1 1.5 gpm B-2 3 gpm

REMARKS: Portland cement - Deep zone: 80-69 feet Shallow zone: 44 feet to grade.
*Gravel Pack Setting - Deep Zone: 104 to 81 feet, additional 1 foot of very fine sand pack from 80 feet to 81 feet. Shallow zone: 70 to 44 feet.

DEPTH IN FEET FROM	TO	DESCRIPTION
0	2	Topsoil, brown, silt, pebbles no odor. (Split spoon).
Grade	5	Gravel, very fine to medium (1/8 to 2 inch), round to subangular, multicolored; and very fine to very coarse, subangular to angular tan sand; some brown silt, trace of broken bricks and glass fragments. Discharge = Muddy brown. (Bailer sample).
5	7	Gravel, fine to medium, subangular quartz; sand, very fine to very coarse; brown. (Split spoon).
5	10	Gravel, very fine to medium (1/8 to 1 inch), round to subangular, white; some multi-colored, and very fine to medium, subangular to angular, tan sand; little brown silt. Discharge - Buff brown. (Bailer sample).
10	12	Sand, very fine to very coarse, tan; gravel, very fine to very coarse. (Split spoon)
10	15	Gravel, fine to medium, round to subangular, multicolored and very coarse to fine, angular, tan sand. Discharge = Buff brown. (Bailer sample).
15	17	Sand, very fine to very coarse tan; silt; gravel fine to medium; brown. (Split spoon).

HRC 001 0374

DEPTH IN FEET FROM	TO	DESCRIPTION
15	20	Sand, very fine to very coarse, angular, tan, and very fine to medium (1/8 to 1 inch) round to subangular, multicolored gravel. Discharge = Buff brown. (Bailer sample).
20	22	Sand very fine to very coarse, subangular to angular; gravel, fine to medium, rounded; brown. (Split spoon).
20	25	Sand, very fine to very coarse, angular, tan, and very fine to fine (1/8 to 3/4 inch), subangular, multicolored gravel; little iron oxide. (Bailer sample).
25	27	Sand, fine to medium, trace coarse; trace of silt; brown with gray streaks. (Split spoon).
25	30	Sand, very fine to coarse, subangular to angular, tan and very fine to medium, round to subangular, multicolored gravel; little iron oxide. Discharge = Buff brown. (Bailer sample).
30	32	Gravel, medium to fine; sand, very fine to very coarse; trace of silt. (Split spoon).
30	35	Sand, very fine to coarse, subangular to angular, tan and very fine to medium, round to subangular, multicolored gravel; little iron oxide. Discharge = Buff brown. (Bailer sample).
34.5	36.5	Sand, fine to medium; some coarse; gravel, fine; brown; trace of red clay. (Split spoon).
35	40	Gravel, very fine to medium, round to subangular, some angular, multi-colored, and very fine to very coarse, angular to subangular, tan, sand. Discharge = Buff brown. (Bailer sample).

DEPTH IN FEET FROM	TO	DESCRIPTION
40	42	Sand, fine to very coarse; gravel, fine to medium; brown; trace of iron oxide staining. (Split spoon).
40	45	Sand, very fine to coarse, subangular tan and very fine to fine (1/8 to 3/4 inch), round to subangular, multicolored gravel; little brown silt.
		Discharge = Buff brown. (Bailer sample).
45	46.5	Sand, fine to coarse, brown; trace of gravel; much iron oxide staining at 46.3 feet. (Split spoon).
46.5	47	Sand, fine to medium, gray; trace of silt; trace of clay, gray-white. (Split spoon).
45	50	Sand, very fine to fine, buff and gray; some white, red and yellow sandy clay.
		Discharge = Grayish-yellowish buff. (Bailer sample).
50	52	Sand, fine, some medium; trace of silt; trace of clay, gray-white; no odor. (Split spoon).
50	55	Clayey sand; sand, very fine to fine, gray, with some white clay with little red and yellow streaks.
		Discharge = Buff yellow. (Bailer sample).
55	60	Clayey sand; sand, very fine to fine, gray, with some white clay; trace streaks of yellow clayey sand and iron oxide spots.
		Discharge = Buff yellow.
60	65	Sand, very fine, tan; some grayish-white clay with little yellow clay, few sandstone fragments, trace of iron oxide. Grades to very fine, tan sand.

Discharge = Buff brown.

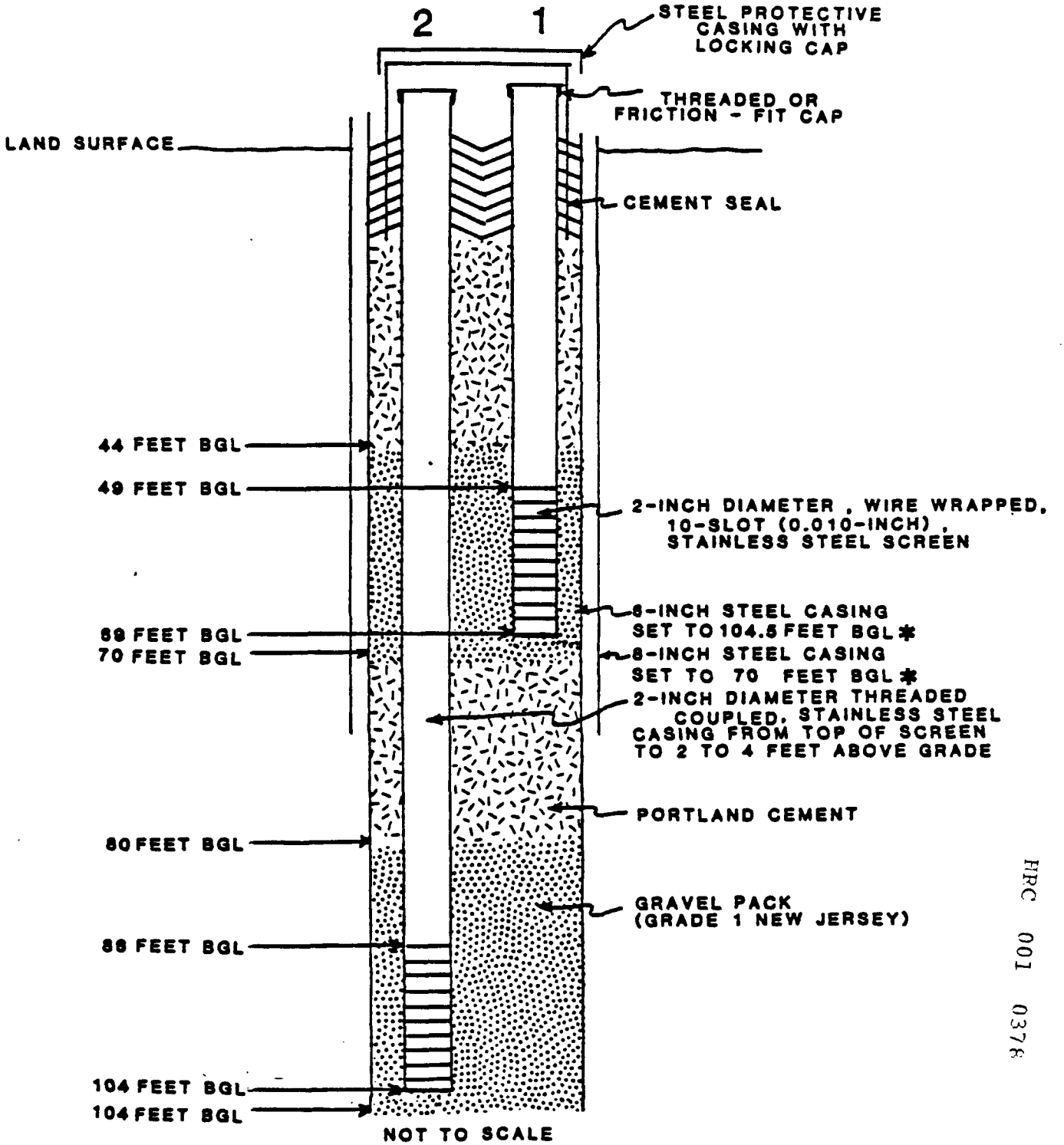
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Yc

WELL NO. Site B

DEPTH IN FEET FROM	TO	DESCRIPTION
65	72	Sand, very fine, tan with little brown silt and trace of muscovite; some thin black and gray clay layers interbedded with gray and little orange (iron oxide) clayey sand. Discharge = Buff brown.
72	78	Sand, very fine to fine, orange; little brown silt, trace muscovite. Discharge = orange.
78	84	Clayey sand, very fine, gray and orange; trace of very fine, black sand and muscovite. Discharge grades from buff to gray-brown.
84	88	Sand, very fine, gray-tan; some gray-tan silt. Discharge = Grayish-tan.
90	94	Sand, very fine, gray-tan; some gray-tan silt. Discharge = Gray-tan.
96	104	Sand, very fine, buff; little buff silt. Discharge = tan.
	104.5	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE B



*ALL CASINGS PULLED DURING WELL INSTALLATION

LEGGETTE, BRASHEARS & GRAHAM, INC.

HRC 001 0378

GEOPHYSICAL WELL LOG

LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

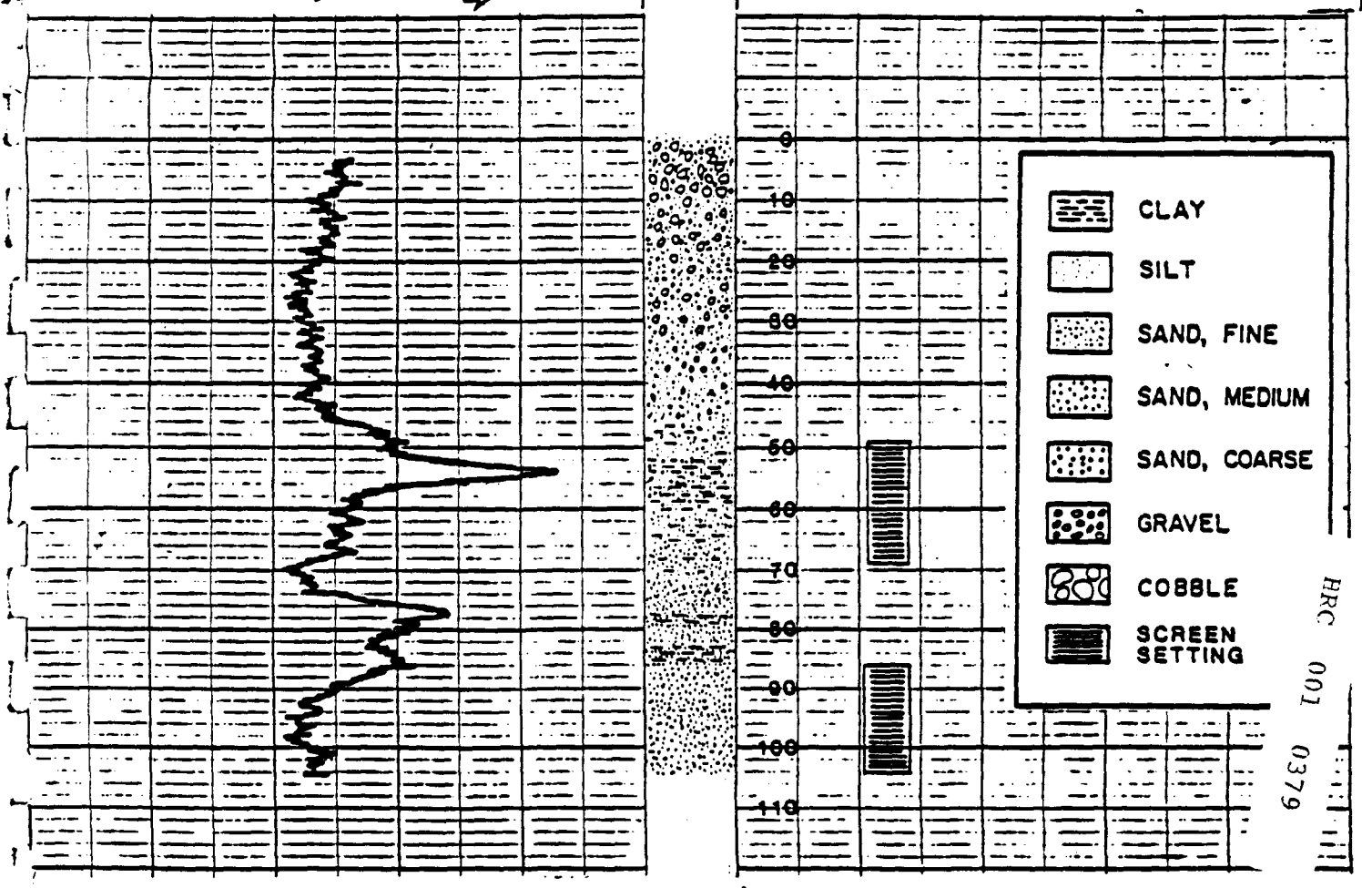
OWNER Whiteman, Osterman & Hanna
LOCATION Former Occidental Chemical Corporation
Plantsite, Hicksville, New York
WELL NO. B
DRILLING METHOD Cable tool
DEPTH DRILLED 104 feet
DEPTH LOGGED 104 feet
DEPTH SCALE 20 feet/inch
LOGGED BY M. Susca and C. Fricke

DATE September 9, 1983
DRILLER R. H. Lauman & Associates, Inc.
REFERENCE POINT Grade
ELEVATION 130.5 feet above mean sea level
CASING 70 feet of 8 inch; 104 feet of 6 inch
HOLE DIAMETER 6-inch to 104 feet
REMARKS Static water level about 54.7 feet below grade.

GAMMA RAY
Scale: 5 counts/second/inch
Time Constant: 3 seconds
Logging Rate: 25 feet/minute

Increasing Radiation

Geol-ogist's Log



HRC 001 0379

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Site C

DATE 09/10/83 PAGE 1 OF 4 PAGES

LOCATION: Behind building 2 near shallow sump

DATE COMPLETED: September 23, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable Tool

SAMPLING METHOD: Bailer and split spoon

SAMPLES EXAMINED BY: C. Fricke

REFERENCE POINT: Land surface

ELEVATION OF R.P.: 133.3 ft. above MSL
C-1 135.62 ft. MSL
C-2 135.60 ft. MSL

WELL CONSTRUCTION
SCREEN TYPE: wire-wrapped stainless steel

DIAM.: 2-inch SLOT NO.: 10

SETTING: 50 to 70 ft.; 114 to 124 ft.

GRAVEL PACK SIZE: Grade 1 New Jersey*

CASING: 2-inch stainless steel

DEVELOPMENT: C-1 11 hrs. airlift
4½ hrs. bailer
C-2 6½ hrs. airlift

PUMPING TEST: None

DATE:

DURATION:

STATIC WATER LEVEL: C-1 78.68 ft. MSL
C-2 77.69 ft. MSL

PUMPING WATER LEVEL:

YIELD: C-1 1 gpm
C-2 6 gpm

REMARKS: Portland cement - Deep zone: 74-103
Shallow zone: 42.5-grade
*Gravel pack setting -
Deep zone: 103-124
Shallow zone: 74-42.5

DEPTH IN FEET FROM	TO	DESCRIPTION
4	8	Cobbles, round, multicolored and very coarse to very fine, subangular to round, multicolored gravel; some very coarse to very fine, tan sand. Discharge = Muddy tan.
8	15	Sand, very coarse to very fine, tan and very coarse to very fine, subangular to round, multicolored gravel; little very fine, multicolored cobble. Discharge = Muddy tan.
15	20	Gravel, very fine, angular, multicolored, and very fine to medium, tan sand; some rounded multicolored cobbles and coarse, rounded to subangular multicolored gravel. Discharge = Muddy tan.
20	25	Sand, very fine to medium, tan and very fine angular multicolored gravel; some medium, subangular, multicolored gravel and coarse, tan sand; little multicolored quartz cobbles, trace silt. Discharge = Cloudy tan.
25	30	Sand, very fine to coarse, tan and very fine to fine rounded multicolored, gravel; trace brown silt. Discharge: Cloudy brown.

HRC 001 0380

DEPTH IN FEET FROM	TO	DESCRIPTION
30	35	Sand, very fine, some very coarse, tan and very fine to fine rounded
		to subangular, multicolored gravel; trace brown silt.
		Discharge = Muddy brown.
35	38	Sand, very fine to very coarse tan and very fine to medium, subangular
		to angular, multicolored gravel; some angular oxidized sandstone
		fragments, little brown silt.
		Discharge = Muddy orange-brown.
38	40	Gravel, very fine to medium, angular, multicolored, and very coarse,
		tan sand; some oxidized sandstone nodules, little silt.
		Discharge = Orange-brown.
40	45	Gravel, very fine to fine, subangular to angular, multicolored and very
		fine to very coarse, tan sand; some oxidized sandstone nodules;
		little silt.
		Discharge = Muddy brown.
45	50	Sand, very fine to fine, angular tan; little brown silt and 1-inch to
		1 1/2-inch layers of very fine to fine orange clayey sand with
		1/8-inch layer oxidized sandstone interbedded, trace very fine sub-
		angular white gravel.
		Discharge = Buff-brown.
	50	Sand, coarse to very fine, gray; some gray and black (oily sheen) claye
		sand; mild odor.
		Discharge = Gray.
50	55	Sand, very coarse to very fine, orangish-tan; some orange, gray, white
		and red interbedded clayey sand and sandy clay.
		Discharge = Muddy brown.

DEPTH IN FEET FROM	TO	DESCRIPTION
	55A	Sand, medium to very fine, gray; some gray, little yellow and trace red clay and sandy clay interbedded with white and black clayey sand; fishy odor. Discharge = Gray.
	55B	Sand, coarse to very fine, gray and black, gray, and red, some yellowish-tan interbedded sandy clays. Discharge = Gray.
55	60	Clay, and sandy clay, gray, yellow, black, white and orangish-red, interbedded; some fine to very fine gray sand; chemical odor. Discharge = Gray.
60	65	Sand, very fine, some very coarse and gray; little (interbedded) gray and black clay with yellow sandy clay. Discharge = Gray.
65	70	Sandy, very fine to fine tan and interbedded white, yellow, red, orange and trace pink, clay. Discharge = Grayish-tan.
70	80	Clay, gray; little very fine, gray clayey sand; trace oxidized sandstone nodules. Discharge = Gray.
80	85	Clay, gray; some orange, red and gray sandy clay, few oxidized sandstone nodules. Discharge = Gray-tan.
85	90	Sandy clay, very fine sand, buff brown with gray clay; trace nodules of sandstone. Discharge = Buff-brown.

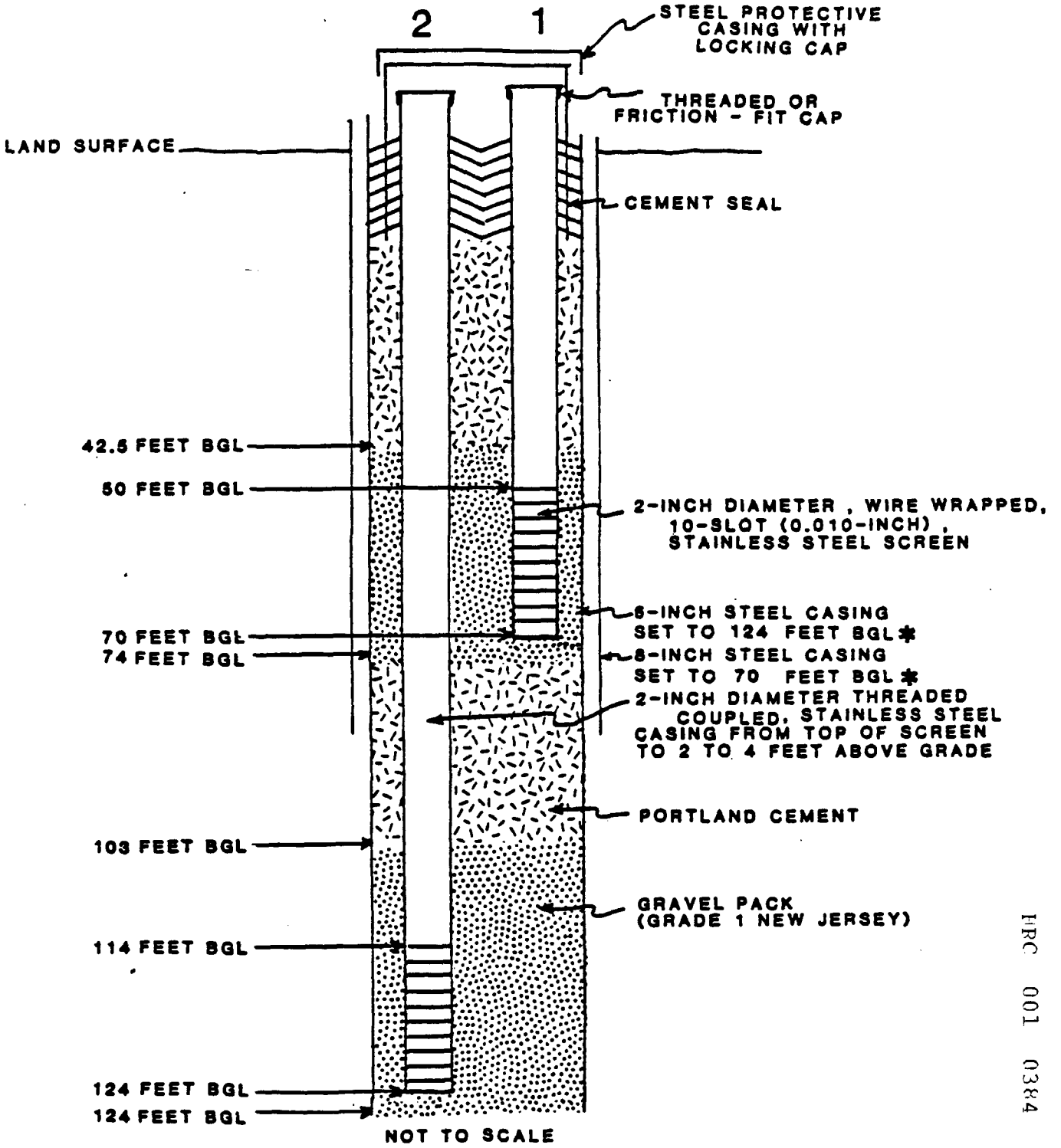
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Yo

WELL NO. Site C

DEPTH IN FEET FROM	TO	DESCRIPTION
90	104	Sandy clay, interbedded layers gray, yellow and black; some very fine, tan sand and tan clay.
	104	Clayey sand, very fine, buff-gray.
104	108	Sand, very fine, buff to gray and gray clay; few lenses of gray sandy clay.
		Discharge = Buff to gray.
108	114	Sand, very fine, gray and gray clay.
		Discharge = Buff-gray.
115	120	Sand, very fine, buff-gray; some gray clay.
		Discharge = Buff-gray.
122	124	Sand, fine, tan; some silt.
	124.5	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE C



* ALL CASINGS PULLED DURING WELL INSTALLATION

HRC 001 0384

LEGGETTE, BRASHEARS & GRAHAM, INC

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Test Boring C

DATE 1/13/84 PAGE 1 OF 2 PAGES

LOCATION: In shallow sump north of building 2.

DATE COMPLETED: July 8, 1983

DRILLING COMPANY: R.H. Lauman & Associates, Inc.

DRILLING METHOD: Cable tool - 6 inch

SAMPLING METHOD: Split Spoon and Bailer.

SAMPLES EXAMINED BY: J. Naso

REFERENCE POINT: Sump bottom

ELEVATION OF R.P.: 127.4 ft. above MSL

WELL CONSTRUCTION

SCREEN TYPE: None

DIAM. _____ SLOT NO. _____

SETTING _____

GRAVEL PACK SIZE _____

CASING _____

DEVELOPMENT _____

PUMPING TEST

DATE _____

DURATION _____

STATIC WATER LEVEL: 48.6 ft. below grade

PUMPING WATER LEVEL _____

YIELD _____

REMARKS: 6-inch casing withdrawn and test boring grouted to surface.

DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION
0	2	Sand, very fine to medium, white and brown. (Split spoon).
0	5	Sand, very coarse, tan; gravel, medium to coarse, angular to subangular quartz; no odor. (Bailer sample).
5	7	Sand, fine to very coarse, brown; gravel fine to to medium; no odor. (Split spoon).
10	12	Sand, medium to coarse, with some fine, tan; gravel, fine to very coarse; slight odor. (Split spoon).
10	15	Gravel, fine to very coarse; sand, fine to very coarse, tan. (Bailer sample).
15	17	Gravel, fine to very coarse; large subangular pebbles; sand, fine to very coarse; trace of clay, gray. (Split spoon).
15	20	Gravel, medium to very coarse; sand, fine to very coarse; trace of clay, white and gray. (Bailer sample).
20	22	Sand, coarse to very coarse with some fine, tan; gravel, fine to very coarse, angular to subangular quartz; trace of clay, red. (Split spoon).
25	27	Sand, very coarse to fine, tan; gravel, fine to medium; trace of clay, red, white, gray. (Split spoon).

OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Y

WELL NO. Test Boring C

DEPTH IN FEET FROM	TO	DESCRIPTION
30	32	Sand, fine to coarse, brown; gravel fine to medium; iron oxide staining at 32 feet. (Split spoon).
30	35	Gravel, fine to very coarse, angular to subangular quartz; sand, fine t very coarse; iron oxide staining. (Bailer sample).
35	37	Sand, fine to medium, tan to white; gravel, fine to coarse; brown; no odor. (Split spoon).
35	40	Sand, medium to very coarse with some fine; tan. (Bailer sample).
40	42	Sand, fine to coarse, tan to gray; trace of clay, gray. (Split spoon).
40	45	Sand, fine to medium, with some very fine, tan. (Bailer sample).
45	47	Sand, fine to medium, with some very fine, tan; trace of clay, gray; no odor. (Split spoon).
47	50	Sand, medium to coarse, some fine, gray; some gravel; pieces of clay, brown.
50	52	Top 6 inches: Sand, very fine to medium, with some coarse, light gray; streaks of clay, red, gray, tan.
		Bottom 6 inches: Sand, very fine to medium, dark gray; trace of clay and silt, gray. (Split spoon).
52	54	Sand, very fine to medium, gray-green; clay, white, gray, yellow. (Split spoon).

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER ~~Whiteman, Osterman & Hanna~~ Former OCC Ruco Division ~~Hicksville, New York~~

WELL NO. Site D

DATE 08/11/83 PAGE 1 OF 3 PAGES

LOCATION: North of fire water tanks, 30 feet from fence

DATE COMPLETED: August 16, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable Tool

SAMPLING METHOD: Split Spoon & Bailer

SAMPLES EXAMINED BY: R. Lamonica

REFERENCE POINT: Grade 130.1 ft. above MSL

ELEVATION OF R.P.: D-1 132.37 ft. MSL; D-2 132.22 ft. MSL

WELL CONSTRUCTION: SCREEN TYPE: wire-wrapped stainless steel

DIAM.: 2-inch SLOT NO.: 10

SETTING: 86 to 91 ft.; 45 to 65 ft.

GRAVEL PACK SIZE: Grade 1 New Jersey*

CASING: 2-inch stainless steel

DEVELOPMENT: D-1 2 hrs. airlift, 13 hrs. bailer; D-2 4 hrs. airlift

PUMPING TEST: None

DATE:

DURATION:

STATIC WATER LEVEL: D-1 77.64 ft. MSL; D-2 77.48 ft. MSL

PUMPING WATER LEVEL:

YIELD: D-1 1 gpm; D-2 4.5 gpm

REMARKS: Cement - Deep zone: 81.5 to 65; Shallow zone: 41 to grade.

*Gravel pack settings- ~~Deep zone: 81.5 to 91~~ feet. ~~Shallow zone: 41 to~~ 65 feet.

DEPTH IN FEET FROM	TO	DESCRIPTION
Grade	2	½ foot topsoil.
		½-inch layer latex.
		Sand, silt, stones and gravel, tan.
		(Above material from shoveled hole).
2	5	Sand, fine to coarse, tan; stones, gravel, and
		silt; some gray silty clay soil. (Bailer
		sample).
5	7	Sand, fine to coarse, tan, stones, gravel and
		silt; no odor; grades from tan to redder
		tan. (Split spoon).
5	10	Stones; gravel, fine to coarse, tan sand and tan
		silt. (Bailer sample).
10	12	Gravel, and fine to coarse, tan sand; trace silt;
		trace gray clay at tip of both spoons.
		(Split spoon).
10	15	Gravel, stones, and tan sand; trace silt.
		(Bailer sample).
15	17	Sand, fine to coarse, tan; gravel, and stones;
		trace silt. (Split spoon).
17	20	Gravel, stones, and fine to coarse, tan sand; no
		odor. (Bailer sample).
20	22	Sand, fine to medium, some coarse tan, gravel,
		and stones; trace silt; no odor. (Split
		spoon).

OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Yo

WELL NO. D

DEPTH IN FEET FROM	TO	DESCRIPTION
22	25	Gravel; fine to coarse, tan sand, and stones (iron oxide stains).
		(Bailer sample).
25	27	Gravel, sand, and stones. (Split spoon).
27	30	Gravel, stones, and fine to coarse sand; trace silt; layer of silty clay
		with sand and stones; 3 to 4-inch concretions of iron oxide and
		staining on quartz grains. (Bailer sample).
30	32	Sand, fine to coarse; trace gravel. (Split spoon).
32	35	Gravel; fine to very coarse tan sand, and stones; some iron oxide con-
		cretions, trace silt and mica; faint odor. (Bailer sample).
35	37	Top 7 inches: Gravel, and fine to coarse sand, with iron oxide
		concretions.
		Bottom 5 inches: Sand, fine to medium, tan with trace layer of red and
		white clay. (Split spoon).
35	37	Gravel, and fine to medium, tan sand, with trace layer of red and
		white clay, iron oxide concretions. (Bailer sample).
38	40	Sand, fine to coarse; trace gravel and pink clay. (Bailer sample).
40	42	Top 10 inches: Sand, fine to medium, tan; trace silt.
		Bottom 5 inches: Sand, fine to medium; trace silt and red clay; no
		odor. (Split spoon).
42	45	Sand, fine to medium; some red and white clayey sand, trace of silt and
		gravel; no odor. (Bailer sample).
45	47	Top 5 inches: Sand, fine to medium, some coarse; trace red silt.
		Bottom 5 inches: Sand, fine to medium, some coarse; trace of red silt
		and red clay in matrix. (Split spoon).

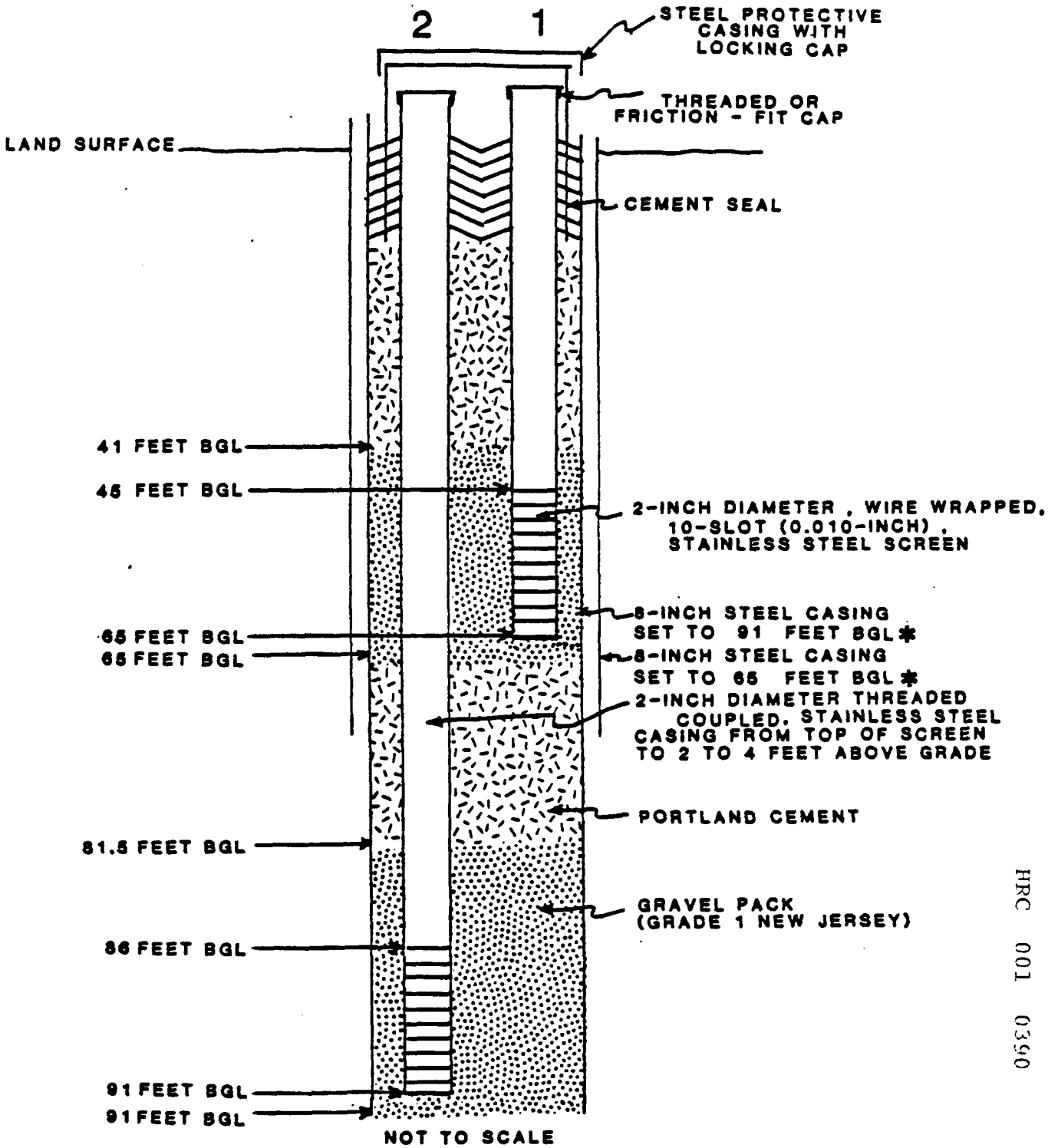
OWNER Whiteman, Osterman & Hanna, Former OCC Buco Division, Hicksville, New Yo

WELL NO. Site D PAGE 3 OF 3 PAGE

DEPTH IN FEET FROM	TO	DESCRIPTION
45	50	Sand, fine to medium, multicolored, and red, white and yellow clay, sandy clay and clayey sand. (Bailer sample).
50	52	Sand, fine to medium, tan, and red and white clayey sand, fine to medium, 1-inch streaks white sandy clay and clay; no odor. (Split spoon).
52	54	Sand, fine to medium, tan with gray, red and yellow sandy clay, clayey sand and solid clay streaks. (Bailer sample).
54	55	Sand, fine to medium, tan. (Bailer sample).
55	57	Sand, fine to medium, tan. (Split spoon).
57	60	Sand, fine to medium, tan; trace red clay. (Bailer sample).
60	62	Sand, fine to coarse, tan; some red clay. (Bailer sample).
62	64	Sand, fine to medium, tan; some gray clayey sand. (Bailer sample).
64	65	Sandy clay, light gray; some iron oxide and tan sand. (Bailer sample).
65	67	Sand, very fine to fine, light gray to buff white, and silt; trace gray clay. (Bailer sample).
67	73	Silt, and very fine, light gray to gray sand; trace yellow and gray clay. (Bailer sample).
73	77	Silt, yellow; very fine, gray sand, and gray and yellow clay. (Bailer sample).
77	80	Silty clay, gray, some yellow and tan. (Bailer sample).
80	85	Silty clay, gray, some yellow and tan. (Bailer sample).
85	87	Sand, very fine to medium, red to tan, and silt. (Split spoon).
85	90	Sand, very fine to medium, red to tan and silt. (Bailer sample).
90	95	Sand, very fine to coarse, tan, and red and gray clay. (Bailer sample).
95	100	Silty clay, reddish-brown; some very fine to medium sand.
	100	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE D



*ALL CASINGS PULLED DURING WELL INSTALLATION

LEGGETTE, BRASHEARS & GRAHAM, INC

GEOPHYSICAL WELL LOG

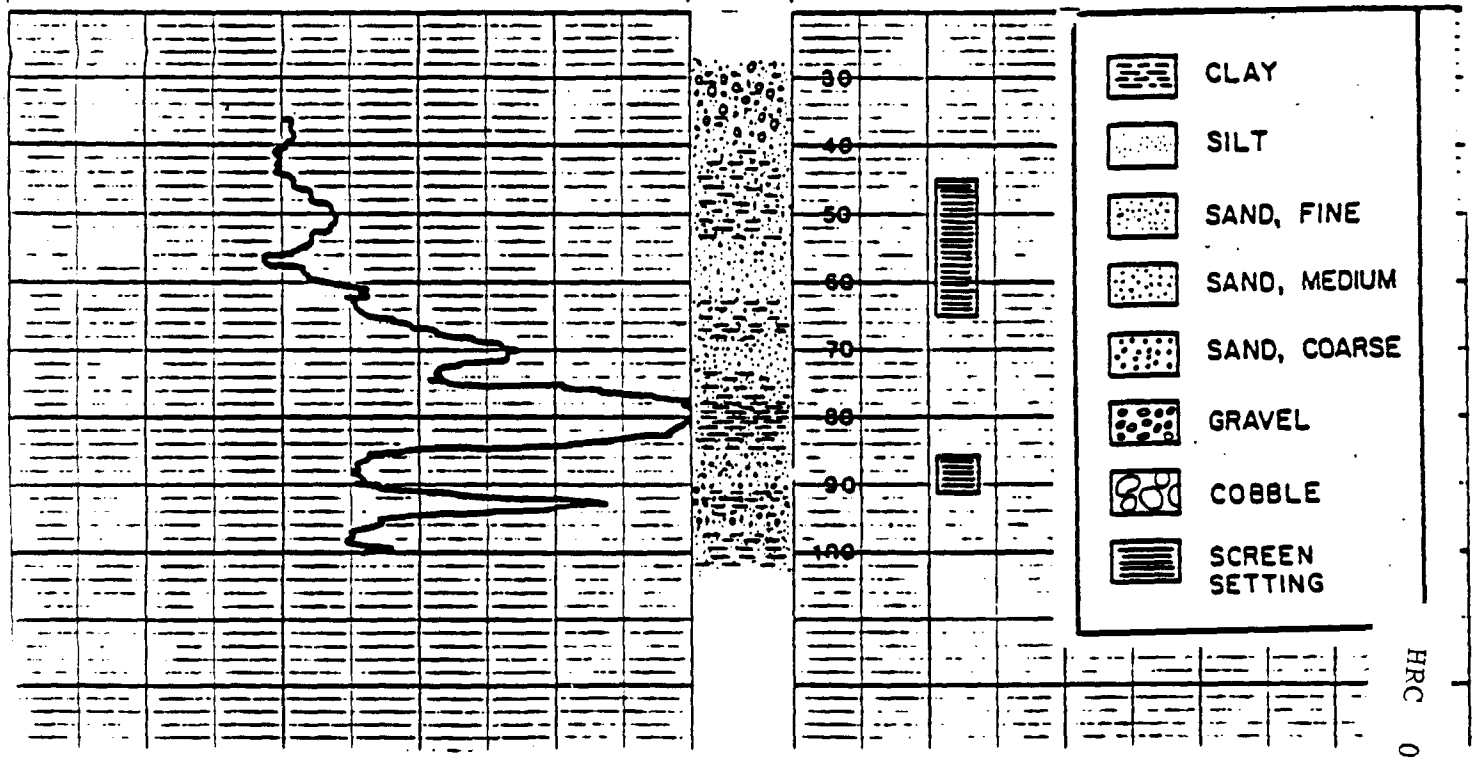
LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
LOCATION Former OCC Ruco Division Plantsite
Hicksville, New York
WELL NO. D
DRILLING METHOD Cable Tool
DEPTH DRILLED 91 feet
DEPTH LOGGED 91 feet
DEPTH SCALE 20 feet/inch
LOGGED BY John Naso, Jr.

DATE August 16, 1983
DRILLER R. H. Lauman & Associates, Inc.
REFERENCE POINT Grade
ELEVATION 110.1 feet above mean sea level.
CASING 67 feet of 8-inch; 91 feet of 6-inch
HOLE DIAMETER 6-inch to 91 feet
REMARKS Static water level is about 55 feet below grade.

GAMMA RAY

SCALE: 7.5 counts/second/inch
TIME CONSTANT: 5 seconds
LOGGING RATE: 25 feet/minute
Increasing Radiation



WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Site E

DATE 06/23/83 PAGE 1 OF 4 PAGES

LOCATION: Between sump No. 3 and storage shed

DATE COMPLETED: August 10, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable Tool

SAMPLING METHOD: Split Spoon & Bailer

SAMPLES EXAMINED BY: R. Lamonica and J. Naso

REFERENCE POINT: Grade 129.3 ft. above MSL

ELEVATION OF R.P.: E-1 131.96 ft. MSL
E-2 131.68 ft. MSL

WELL CONSTRUCTION
SCREEN TYPE: wire-wrapped stainless steel
DIAM.: 2-inch SLOT NO.: 10
SETTING: 46 - 66 ft.; 75 - 90 ft.
GRAVEL PACK SIZE: Grade 1 New Jersey*
CASING: 2-inch stainless steel
DEVELOPMENT: E-1 14 hrs. bailer, 8 hrs. bailer
E-2 6 hrs. airlift

PUMPING TEST: None
DATE:
DURATION:
STATIC WATER LEVEL: E-1 77.40 ft. MSL, E-2 77.31 ft. MSL
PUMPING WATER LEVEL:
YIELD: E-1 1 gpm, E-2 2 gpm

REMARKS: Cement - 90-103 feet, 71-65.75 feet, 42.8-grade.
Sand pack - Deep zone: 90 to 71 feet. Shallow zone: 65.75 to 42.8 feet.
Stick-up - Shallow: 2.7 feet. Deep: 2.4 feet.

DEPTH IN FEET FROM	TO	DESCRIPTION
.6	.6	Sand, very coarse to medium with some fine, tan strong paint-like odor.
.6	2.0	Sand, medium to fine with some very fine, dark brown; very strong paint-like odor. (Above material from shoveled hole and split spoon (1.6 - 1.5)).
2.0	4.0	Sand, medium to coarse, light tan, and medium to coarse with some fine gravel. (Bailer sample).
4.0	5.0	Gravel, medium to coarse, and medium to very coarse, with some fine; tan and gray sand; silt; rubber-like material, very strong odor. (Bailer sample).
5.0	6.5	Sand, coarse to very coarse, with some medium and fine, light brown to tan; gravel, and silt. (Split spoon).
6.5	10.0	Gravel, well-rounded; stones; and fine to very coarse, tan-brown sand. (Bailer sample).
10.0	11.5	Sand, fine to medium, some coarse, tan-brown; gravel and small stones. (Split spoon).
11.5	15.0	Sand, fine to very coarse tan-brown; well-rounded, gravel and stones. (Bailer sample
15.0	17.0	Sand, fine to coarse tan-brown; well-rounded, gravel and stones, trace of white clay and silt. (Split spoon).

HRC 001 0392

DEPTH IN FEET FROM	TO	DESCRIPTION
17.0	20.0	Stones, (1-inch to 3-inch), rounded gravel and fine to very coarse, tan, sand. (Bailer sample).
20.0	22.0	Gravel; well-rounded, quartzitic stones and fine to very coarse, brown sand. (Split spoon).
22.0	25.0	Gravel; well-rounded, quartzitic stones and fine to very coarse, brown sand. (Bailer sample).
25.0	27.0	Gravel; well-rounded, quartzitic stones and fine to very coarse, brown sand. (Split spoon).
27.0	30.0	Gravel, fine to very coarse; 1-inch rounded quartzitic pebbles and fine to very coarse, tan sand. Discharge = Orange-rust. (Bailer sample).
30.0	32.0	Sand, fine to very coarse, light tan to tan; trace white, red and gray clay and fine gravel. (Split spoon).
32.0	35.0	Sand, fine to very coarse, tan and fine to very coarse, subangular quartz gravel; rust. (Bailer sample).
35.0	37.0	Sand, very fine to coarse, and fine to medium, brown; gravel; changing to whitish-tan gravel at 36.7 feet; trace white and gray clay in tip sample. (Split spoon).
37.0	40.0	Sand, fine to very coarse, tan; brown to orange silt and fine, sub-angular quartz gravel; (Bailer sample). Discharge = orange-red.
40.0	42.0	Sand, fine to coarse, tan to light gray; trace gray clay. (Split spoon).
42.0	44.0	Sand, fine to very coarse, tan and light gray, and silt. (Bailer sample
44.0	45.0	Sand, fine to medium, gray, and gray and yellow clay (dries to tan). (Bailer sample).

DEPTH IN FEET FROM	TO	DESCRIPTION
45.0	47.0	Sand, fine to medium, gray, angular to subangular; trace gray clay.
		(Split spoon).
47.0	48.0	Sand, fine to coarse, angular to subangular, gray; some gray and white
		clay. (Bailer sample).
48.0	50.0	Sand, fine to coarse, gray; some gray clay; oily sheen, very strong
		odor of oil and chemicals.
50.0	52.0	Sand, fine to medium, some coarse, gray; 1-inch lens gray clay; sheen
		and odor. (Split spoon). (Moved off-site July 1, 1983 - returned
		July 20, 1983).
50.5	52.5	Sand, fine to medium, gray and white banded; some clay and silt; top
		1-inch oily with strong odor; sample color getting lighter with
		depth; odor throughout; dry. (Split spoon).
52.5	54.0	Sand, fine to medium, gray; some tan, plastic clay. (Bailer
		sample).
54.0	56.0	Sand, fine to medium, gray; some clay and silt. (Split spoon).
56.0	59.5	Sand, fine to medium, light gray, quartzitic; trace biotite mica; oily
		sheen and strong odor, which appears to be getting weaker with
		depth; occasional clay and silt lumps. (Bailer sample).
59.5	61.5	Sand, fine to medium, gray; trace silt and clay. (Split spoon).
61.5	64.0	Sand, medium to very coarse, some fine, gray; strong odor; no oily sheer
64.0	65.0	Sand, medium to very coarse, some fine, gray; few lumps gray clay and
		sandy clay. (Bailer sample).
65.0	70.0	Sand, fine to very coarse, gray; silt; fine gravel; slight odor.
		(Bailer sample).

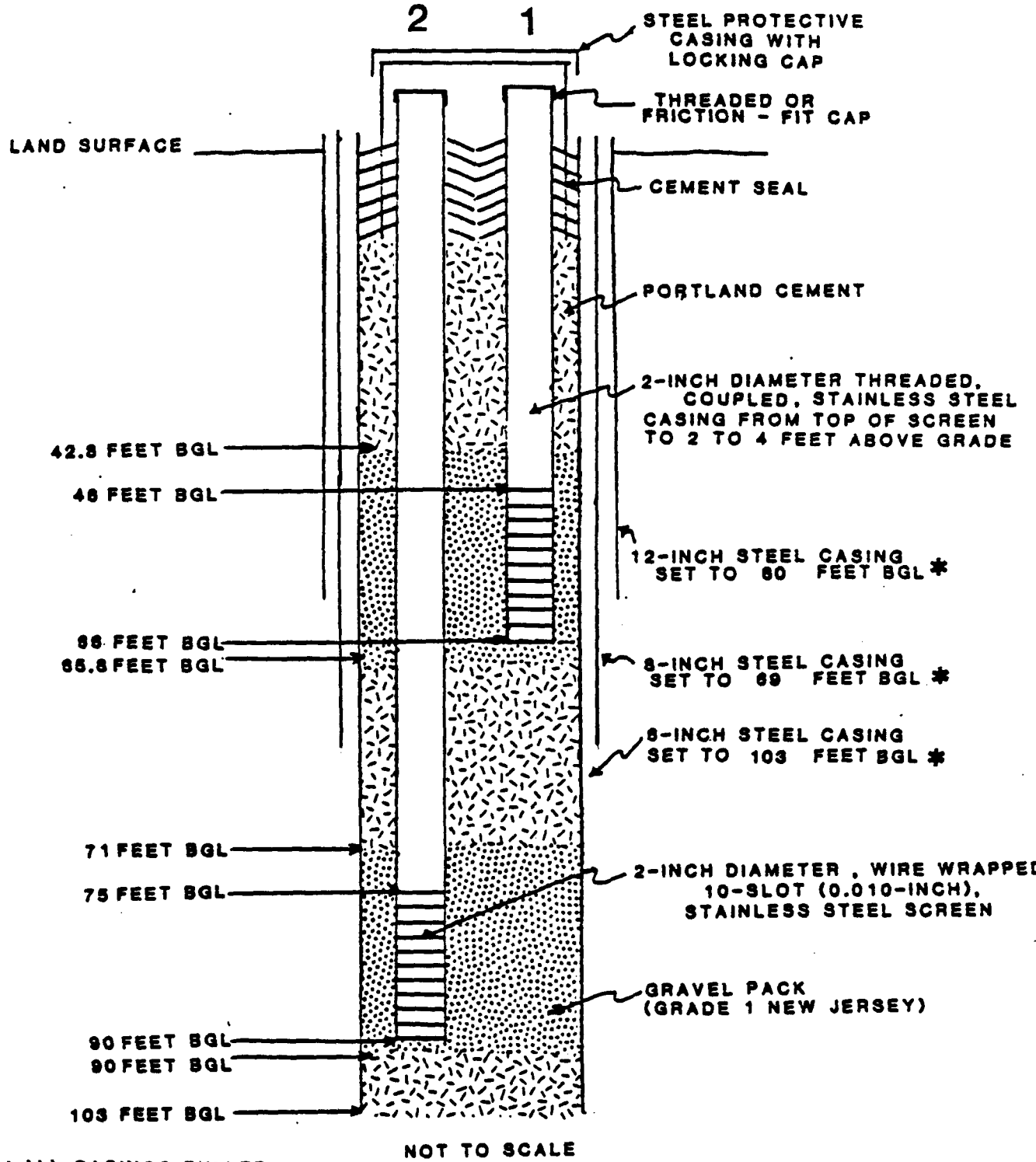
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New Yo

WELL NO. Site E

DEPTH IN FEET FROM	TO	DESCRIPTION
70.0	72.0	Sand, very fine to coarse, gray, and silt; odor. (Bailer sample).
72.0	74.0	Sand, very fine, light gray, and silt. (Bailer sample).
74.0	80.0	Sand, very fine to fine, with some medium, gray to light gray, and silt; trace gray clay; odor. (Bailer sample).
80.0	81.7	Sand, very fine to fine, gray; silt; clay; odor. (Bailer sample).
81.7	83.7	Sand, very fine to fine, gray; silt; clay; odor. (Split spoon).
83.7	103	Sand, very fine to fine, gray; clay; silt; slight odor. (Bailer sample).
	103.3	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE E



HRC 001 0396

LEGGETTE, BRASHEARS & GRAHAM, INC.

GEOPHYSICAL WELL LOG

LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
LOCATION Former OCC Ruco Division Plantsite
Hicksville, New York
WELL NO. E
DRILLING METHOD Cable Tool
DEPTH DRILLED 103.3 feet
DEPTH LOGGED 94 feet
DEPTH SCALE 20 feet/inch
LOGGED BY John Naso

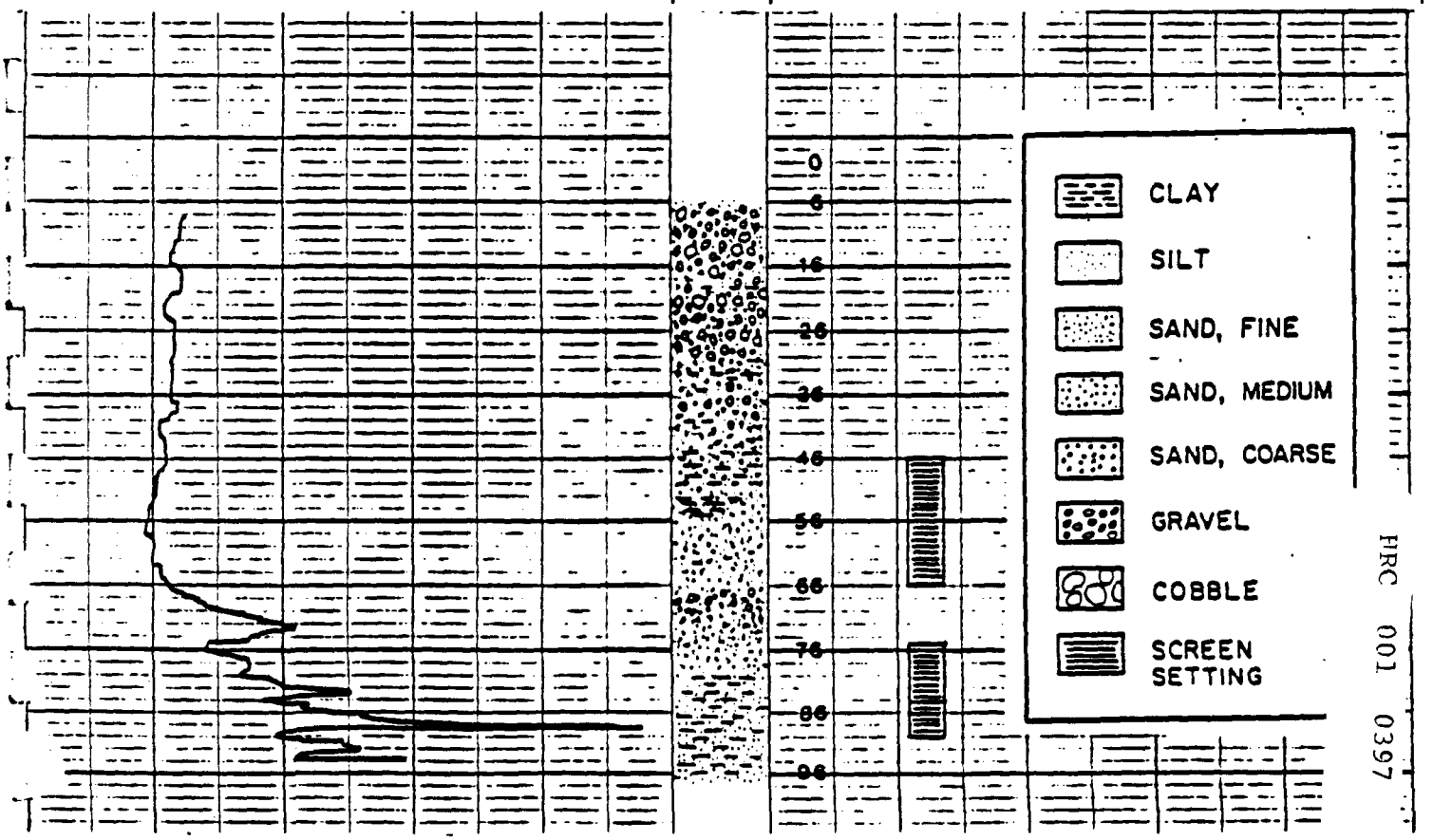
DATE August 10, 1983
DRILLER R. H. Lauman & Associates, Inc.
REFERENCE POINT Grade
ELEVATION 129.3 feet above mean sea level
CASING 60 feet of 12-inch; 70 feet of 8-inch; 103.3 feet of 6-inch.
HOLE DIAMETER 6-inch to 103.3 feet

REMARKS Static water level about 54.5 feet below grade.

GAMMA RAY

SCALE: 7.5 counts/second/inch
TIME CONSTANT: 5 seconds
LOGGING RATE: 25 feet per minute
Increasing Radiation

Geol-ogist's Log



WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Site F

DATE 9/27/83 PAGE 1 OF 3 PAGES

LOCATION: South end of plant near sump No. 2 & railroad tracks.

DATE COMPLETED: September 27, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable Tool

SAMPLING METHOD: Split Spoon and Bailer

SAMPLES EXAMINED BY: R. Lamonica & C. Fricke

REFERENCE POINT: Grade 129.8 ft. above MSL
F-1 131.79 ft. MSL
F-2 131.56 ft. MSL

ELEVATION OF R.P.

WELL CONSTRUCTION
SCREEN TYPE: wire-wrapped stainless steel

DIAM.: 2-inch SLOT NO.: 10

SETTING: F-1 47.5-67.5 ft. bgl
F-2 90-110 ft. bgl

GRAVEL PACK SIZE: Grade 1 New Jersey

CASING: 2-inch stainless steel

DEVELOPMENT: F-1 14 hrs. bailer
1 hr. airlift
F-2 5 hrs. airlift

PUMPING TEST: None

DATE:

DURATION:

STATIC WATER LEVEL: F-1 76.99 ft. MSL
F-2 76.88 ft. MSL

PUMPING WATER LEVEL:

YIELD: F-1 1 gpm
F-2 5 gpm

REMARKS: Sand pack: 80.5-111 ft.; 71-35 ft. bgl
Grout: 80.5-71 ft. bgl
35 ft.-grade.

DEPTH IN FEET FROM	TO	DESCRIPTION
Grade	0.5	Fill; stones, sand and silt.
0.5	1.5	Sand, silt and gravel; some stains.
1.5	5.0	Stones, gravel, fine to coarse sand and brown silt; no odor. (Bailer sample).
5	7	Sand, fine to coarse; brown gravel and silt; trace clay. (Split spoon).
5	10	Gravel; stones; fine to coarse, brown sand and brown silt; no odor. (Bailer sample).
10	12	Gravel; fine to coarse sand, and brown to tan silt; trace white clay in tip of spoon. (Split spoon).
15	17	Sand, fine to coarse; gravel and brown silt. (Split spoon).
15	20	Sand, fine to coarse; tan; gravel and stones. (Bailer sample).
20	22	Top 6 inches: Sand, fine to coarse, tan and gravel.
		Middle 6 inches: Sand, fine to coarse; brown silt and gravel.
		Bottom 6 inches: Sand, fine to medium; some tan to gray silt. (Split spoon).
20	25	Gravel, fine to very fine, some medium; multi-colored and very coarse to coarse, some medium sand; trace brown silt and iron stain. Discharge = muddy brown. (Bailer sample).

HRC 001 0398

DEPTH IN FEET FROM	TO	DESCRIPTION
25	30	Sand, medium to fine, some coarse, angular, tan; and very fine, some fine, multicolored, subangular gravel. (Bailer sample).
30	35	Sand, medium to coarse, some fine, tan; very fine to fine multicolored subangular gravel and iron oxide nodules; some iron oxide concretions and brown silt; trace subangular multicolored cobbles. Discharge = Orange-brown. (Bailer sample).
35	40	Sand, medium to coarse, some fine to very fine, tan to brown and multi-colored fine gravel; some gray sandy clay; slight odor. (Bailer sample).
40	42	Clay, sandy, gray interbedded with fine gray clayey sand and thin (½-inc band of iron oxide; slight odor. (Split spoon).
40	45	Clay, sandy, gray and gray silt; slight odor. (Bailer sample).
45	48	Silt; fine, with some medium and coarse sand; gray clay and iron oxide stains; slight odor. (Bailer sample).
48	50	Silt, olive with fine sand and trace clay interbedded with plastic gray clay and micaceous gray sandy clay; strong odor. (Bailer sample).
	51	Sand, fine to very coarse, silt and plastic gray clay; no odor. (Bailer sample).
51.5	53.5	Sand, fine, silty, brown-gray, and sandy, brown-gray silt; no odor. (Split spoon).
50	55	Sand, fine to very coarse and tan silt; layers of fine sand and olive-brown silt; trace gravel; some odor. (Bailer sample).
55	60	Sand, fine and tan silt; slight "sweet" odor. (Bailer sample).
55	58	Sand, fine to medium and tan silt; no odor (Bailer sample).
58	60	Sand, fine to medium; trace white-gray silt; no odor. (Bailer sample).

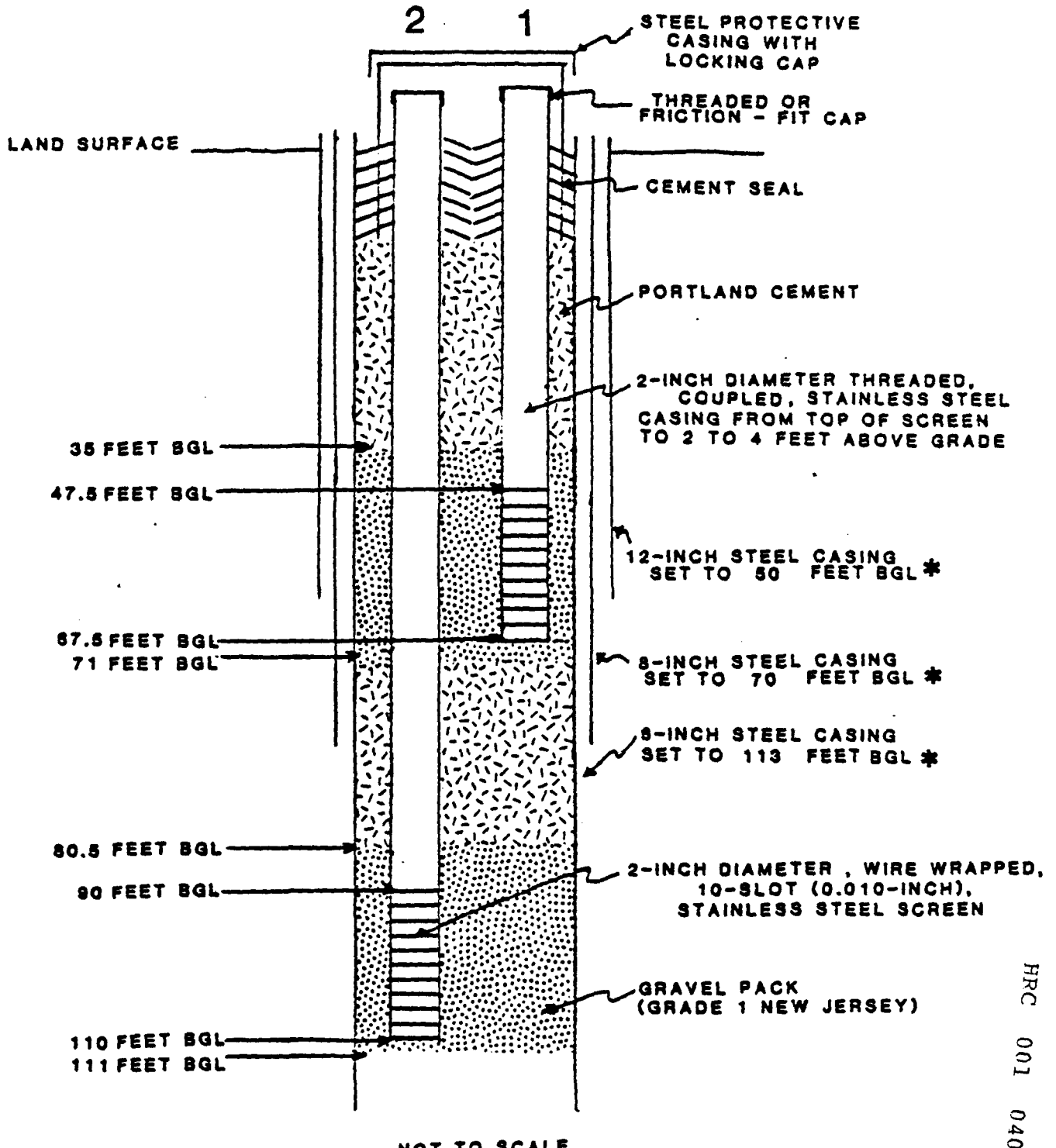
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco , Hicksville, New York

WELL NO. Site F PAGE 3 OF 3 PAGES

DEPTH IN FEET FROM	TO	DESCRIPTION
60	62	Sand, fine to medium; trace white-gray silt, slight odor. (Bailer sample
62	64	Sand, fine to medium; white gray; trace silt; very strong odor; no oil.
		Discharge = Dark gray-brown. (Bailer sample).
64	65	Sand, fine to coarse; trace gray silt; strong odor, no oil; (Bailer
		sample).
	65	Sand, fine to coarse, olive silt and iron oxide concretions; strong odor.
		(Bailer sample).
65	67	Sand, fine to very coarse; fine gravel and olive silt; some gray clay
		and sandy gray clay; strong odor. (Bailer sample).
	68	Clay, sandy, gray and fine olive sand; strong odor (Bailer sample).
68	70	Clay, sandy and silty, gray; strong odor. (Bailer sample).
70	82	Sand, clayey and silty, fine, gray, some olive; strong odor.
		(Bailer sample).
82	84	Sand, silty, fine, olive and gray, runny; strong odor. (Bailer sample).
84	90	Sand, silty, fine, olive and gray, runny; strong odor. (Bailer sample).
90	95	Sand, very fine, subangular and gray silt; few biotite flakes; chemical
		odor. (Bailer sample).
95	100	Sand, very fine to fine subangular and gray silt; some muscovite, little
		tourmaline(?) (black particles); odor. (Bailer sample).
100	110	Sand, very fine to fine, subangular and gray silt; some muscovite and
		feldspar; little tourmaline(?) (black particles); strong odor in cla
		lumps. (Bailer sample).
110	113	Sand, medium. (Bailer sample).
	113	Clay, gray and tan, layers on bottom of bailer.
	113	Bottom of borehole.

WHITEMAN, OSTERMAN & HANNA
FORMER OCC PLANTSITE
HICKSVILLE, NEW YORK

CONSTRUCTION OF MONITOR WELLS AT SITE F



*ALL CASINGS PULLED DURING WELL INSTALLATION

HRC 001 0401

LEGGETTE, BRASHEARS & GRAHAM, INC.

GEOPHYSICAL WELL LOG

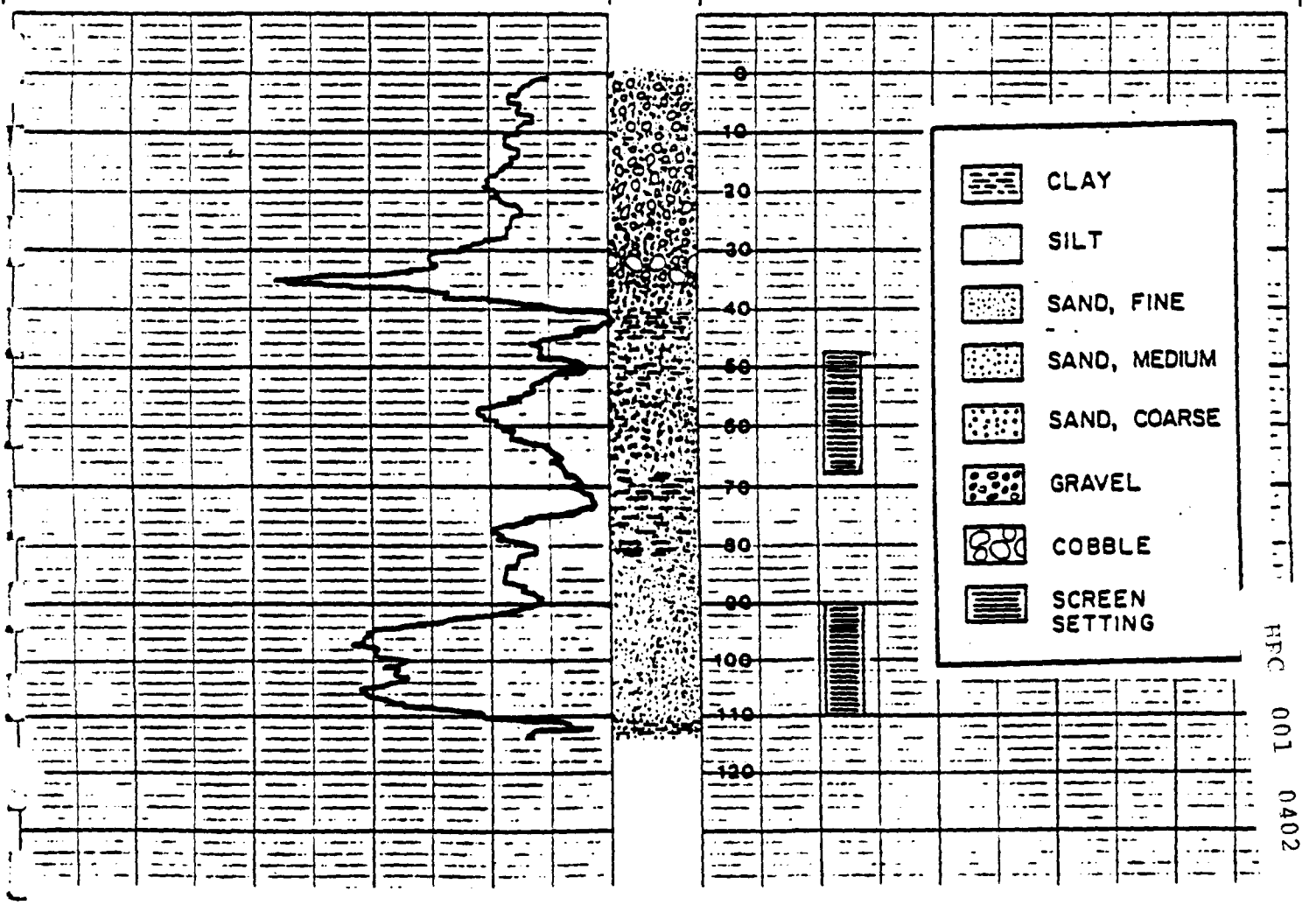
LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
LOCATION Former OCC Ruco Division Plantsite
Hicksville, New York
WELL NO. F
DRILLING METHOD Cable Tool
DEPTH DRILLED 114 feet
DEPTH LOGGED 112 feet
DEPTH SCALE 20 feet/inch
LOGGED BY Cintra Fricke

DATE October 5, 1983
DRILLER R. H. Lauman & Associates, Inc.
REFERENCE POINT Land Surface
ELEVATION 129.8 feet above mean sea level
CASING 12-inch to 50 feet; 8-inch to 70 feet; 6-inch to 114 feet.
HOLE DIAMETER 6-inch (inner casing)
REMARKS Static water level is about 54 feet below grade.

GAMMA RAY
SCALE: 10 counts/second/inch
TIME CONSTANT: 3 seconds
LOGGING RATE: 21 feet/minute
Increasing Radiation

Geol-ogist's Log



HFC 001 0402

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

OWNER Whiteman, Osterman & Hanna
Former OCC Ruco Division
Hicksville, New York

WELL NO. Test Boring F

DATE 1/16/84 PAGE 1 OF 2 PAGES

LOCATION: Bottom of sump no. 2 southern most corner of plant.

DATE COMPLETED: July 19, 1983

DRILLING COMPANY: R. H. Lauman & Associates, Inc.

DRILLING METHOD: Cable tool - 6 inch

SAMPLING METHOD: Split Spoon and Bailer.

SAMPLES EXAMINED BY: R. Lamonica & J. Naso

REFERENCE POINT: Grade: (sump bottom)

ELEVATION OF R.P.: 113.8 ft. above MSL

WELL CONSTRUCTION
SCREEN TYPE: None
DIAM. SLOT NO.
SETTING
GRAVEL PACK SIZE
CASING
DEVELOPMENT

PUMPING TEST
DATE
DURATION
STATIC WATER LEVEL: Approx. 39 ft. below grade.
PUMPING WATER LEVEL
YIELD

REMARKS: 6 inch casing removed and hole grouted to surface.

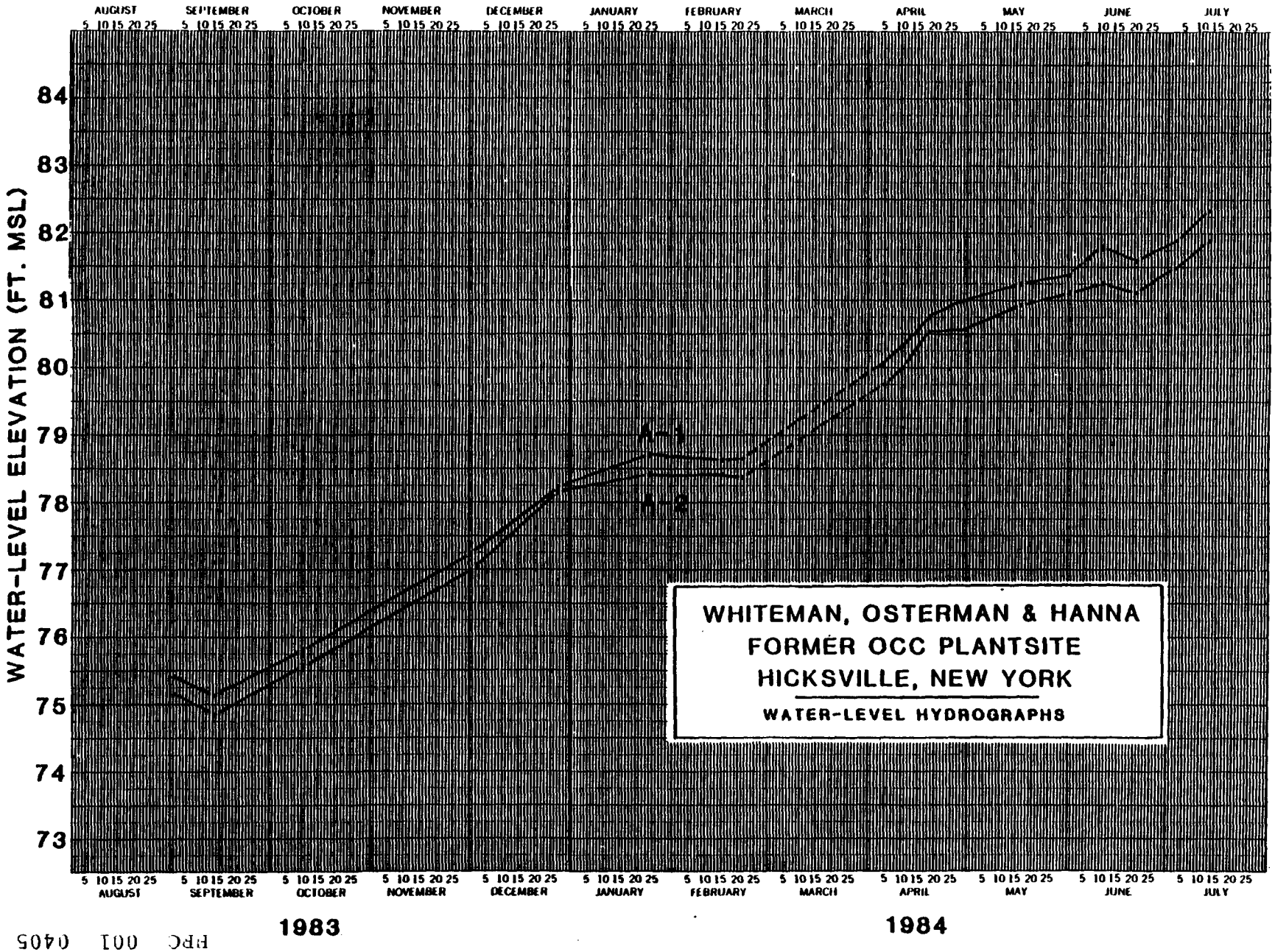
DEPTH IN FEET FROM	TO	DESCRIPTION
		Top ½-inch of sump bottom is a dry gray filter cake; ½-inch to 1-inch is brown-stained sand; 1-inch to 2-inches is clean sand and gravel.
1	2.5	Sand, fine to coarse; gravel and silt; brown; (Top 6 inches stained dark, bottom has clea appearance); strong odor. (Split spoon).
0	11.5	Sand, fine to very coarse; gravel; stones (to 3-inches); brown; slight odor. (Bailer sample).
11.5	13.3	Sand, fine to coarse; gravel; trace of silt; brown; some black staining; mild odor. (Split spoon).
13.5	15	Sand, fine to coarse; gravel; brown; very slight odor. (Bailer sample).
15	17	Sand, fine to coarse; with some brown silt and a trace of gravel; no odor. (Split spoon).
17	20	Sand, very fine to coarse; some gravel; discharge is dark gray, getting darker with depth; black stones causing color.
20	22	Sand, fine to medium, and silt, with streaks of gray clay; some odor. (Split spoon).
22	25	Sand, very fine, gray, with gray silt and clay. (Bailer sample).

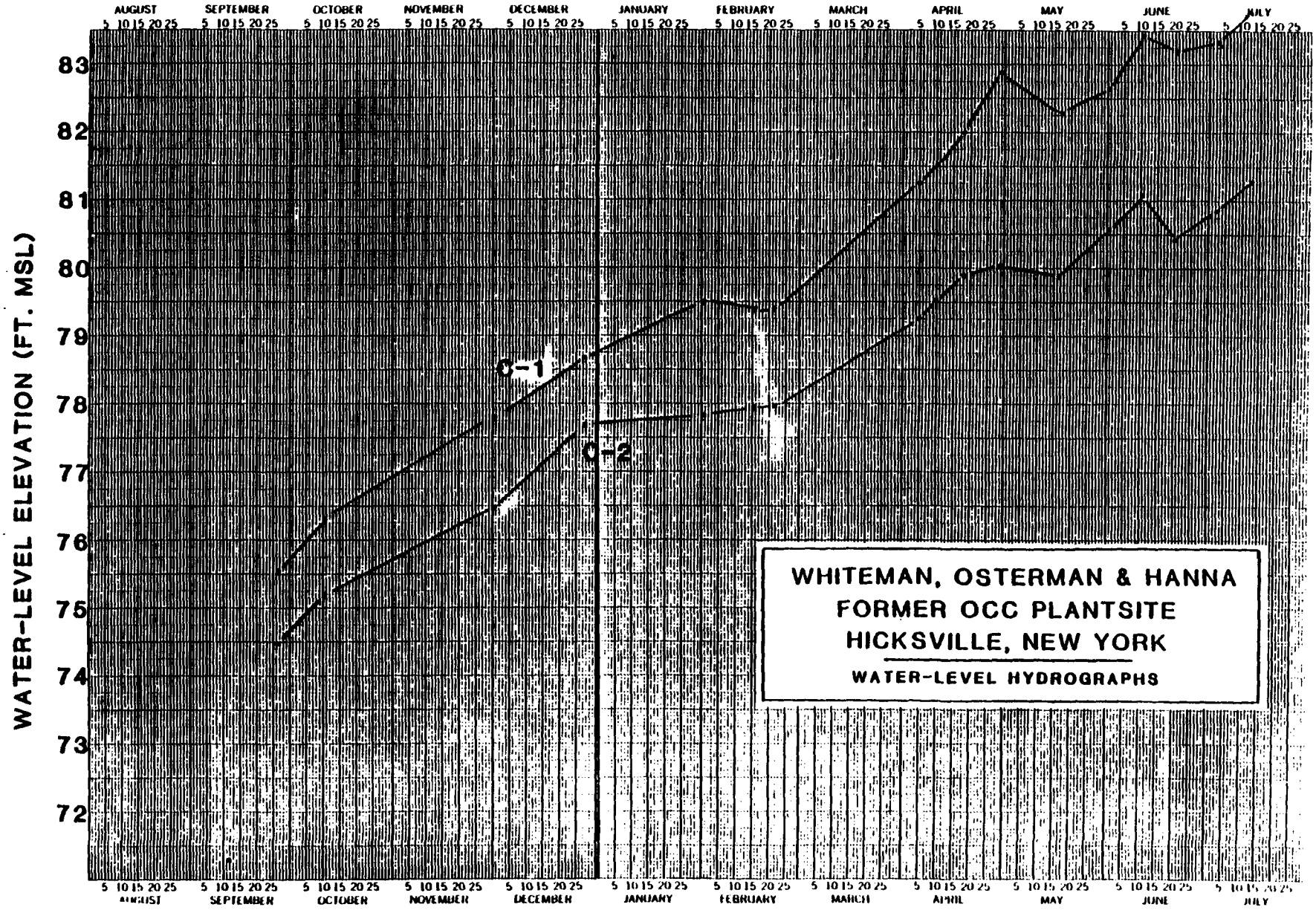
HRC 001 0403

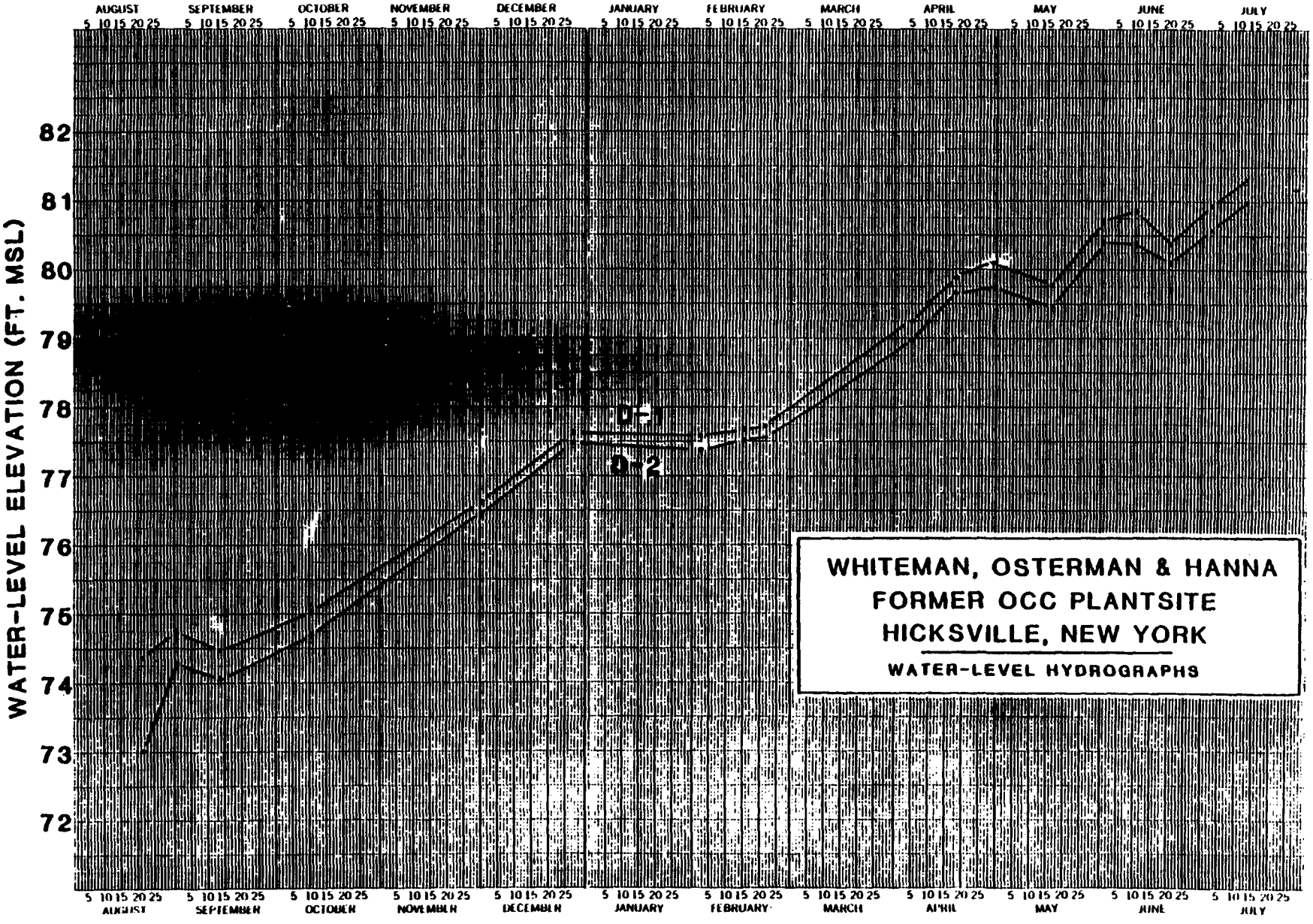
OWNER Whiteman, Osterman & Hanna, Former OCC Ruco Division, Hicksville, New York

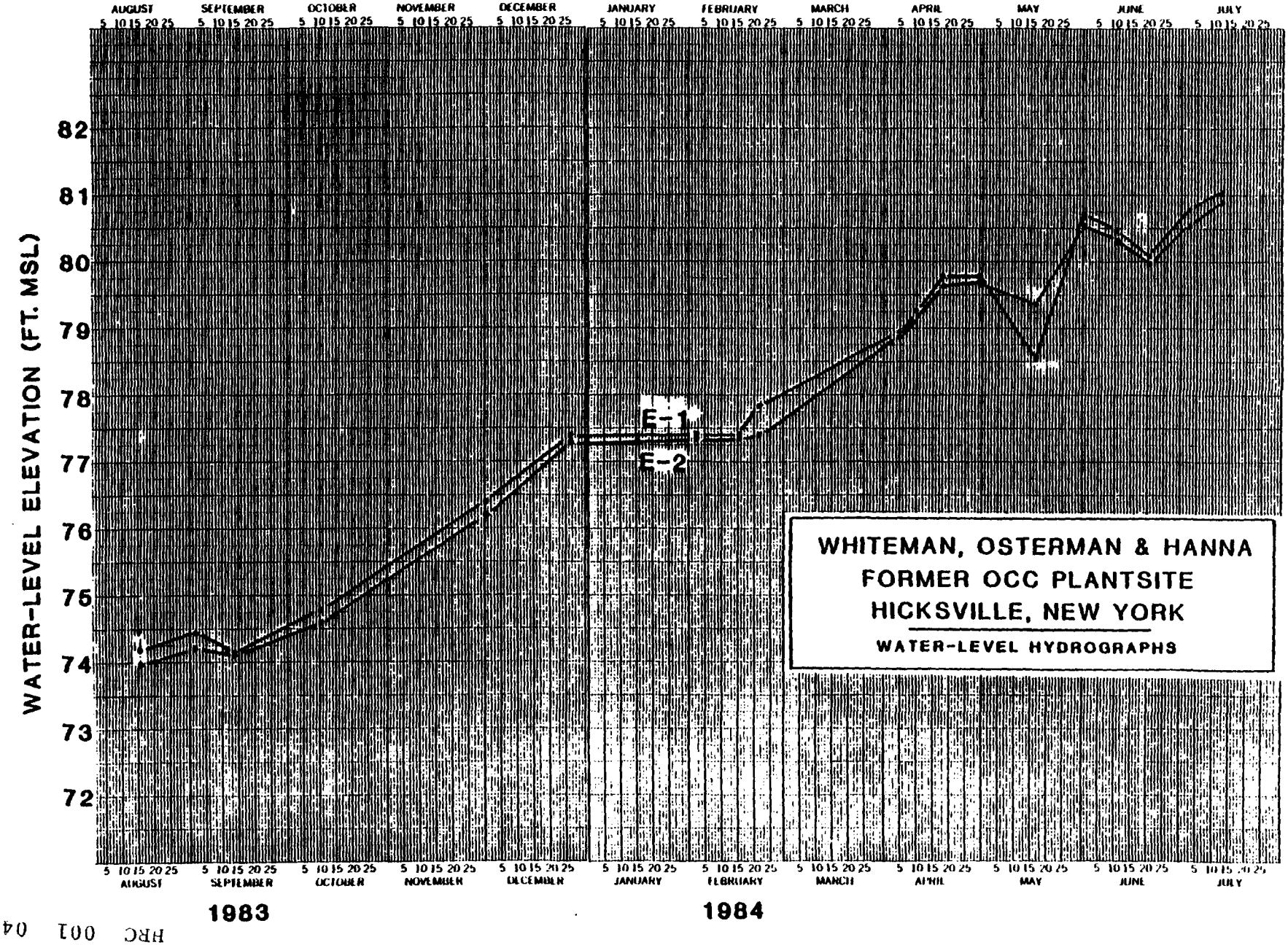
WELL NO. Test Boring F

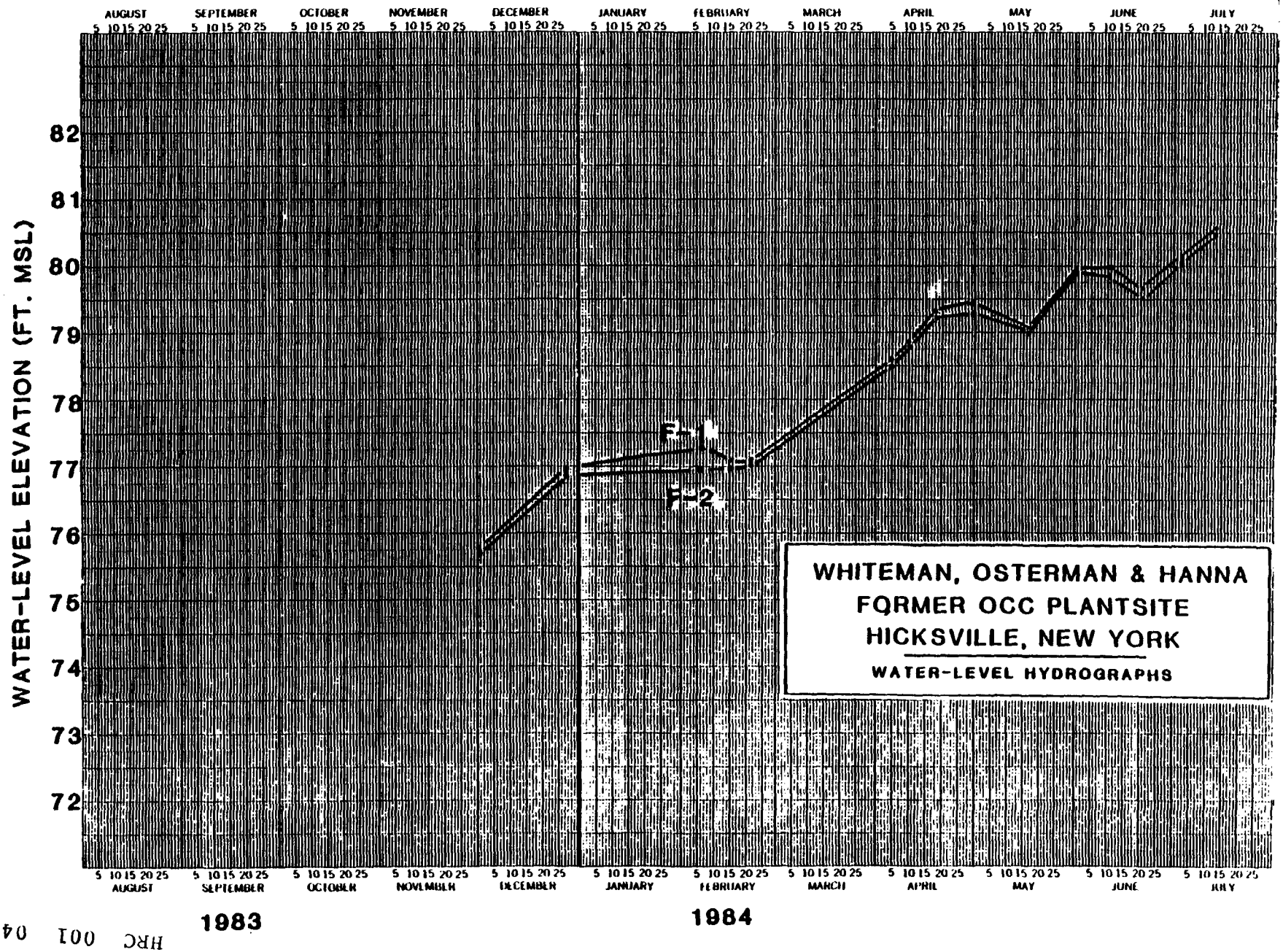
DEPTH IN FEET FROM	TO	DESCRIPTION
25.8	27.8	Sand, very fine, gray, with gray and yellow silt and clay. (Split spoon).
28	30	Sand, very fine, gray, with gray silt and clay. (Bailer sample).
30	32	Sand, very fine to medium, light gray to white; trace of silt. (Split spoon).
32	35	Sand, very fine to fine, with medium sand, tan to white; silt and clay, gray and white. (Bailer sample).
35	37	Sand, very fine to medium, gray; trace of gray silt and clay; slight odor. (Split spoon).
37	40	Sand, very fine to medium gray; silt; clay, gray to dark gray. (Bailer sample).
40	45	Sand, very fine to medium, gray; water discharge was foamy and had slight odor.





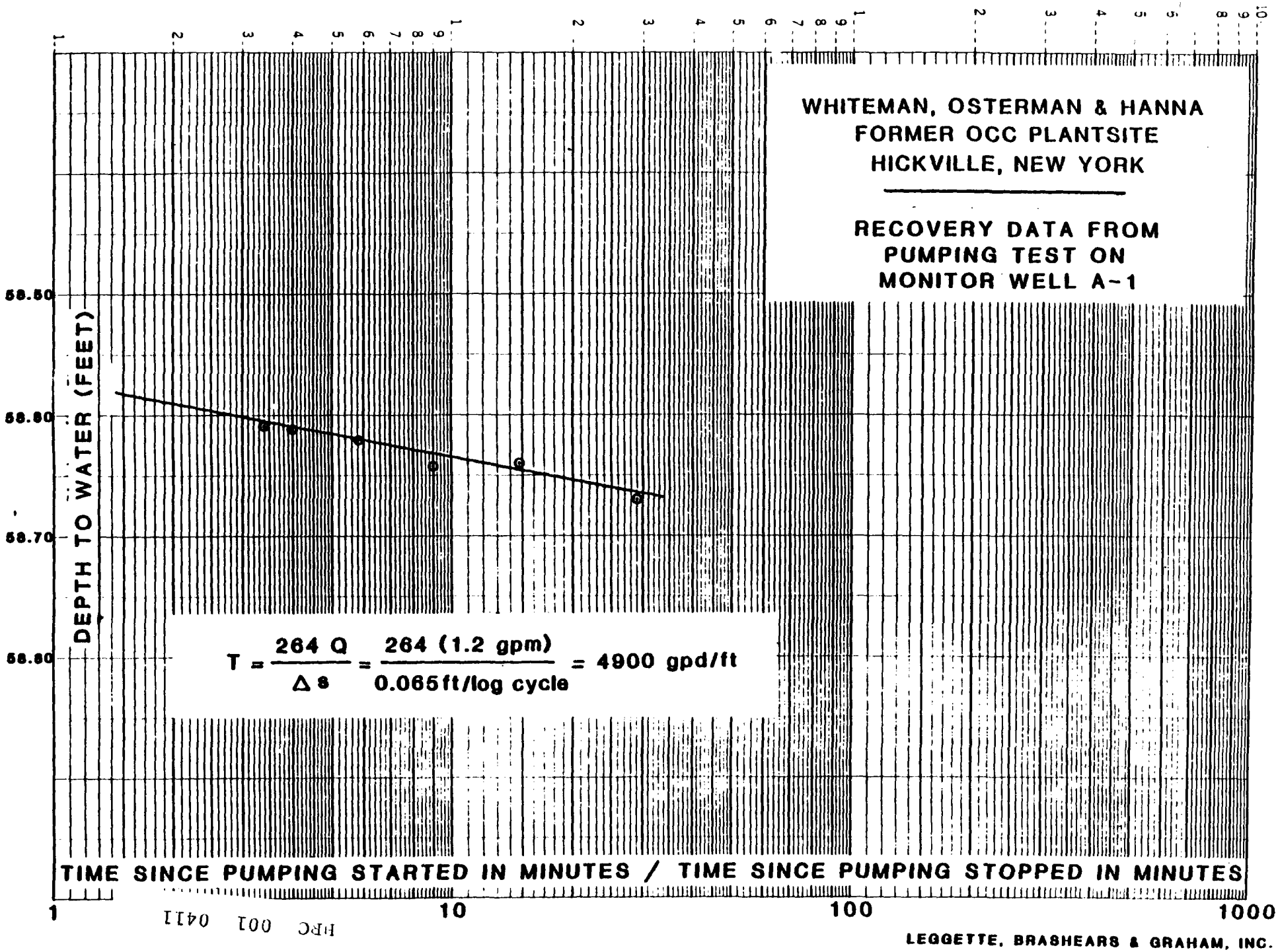


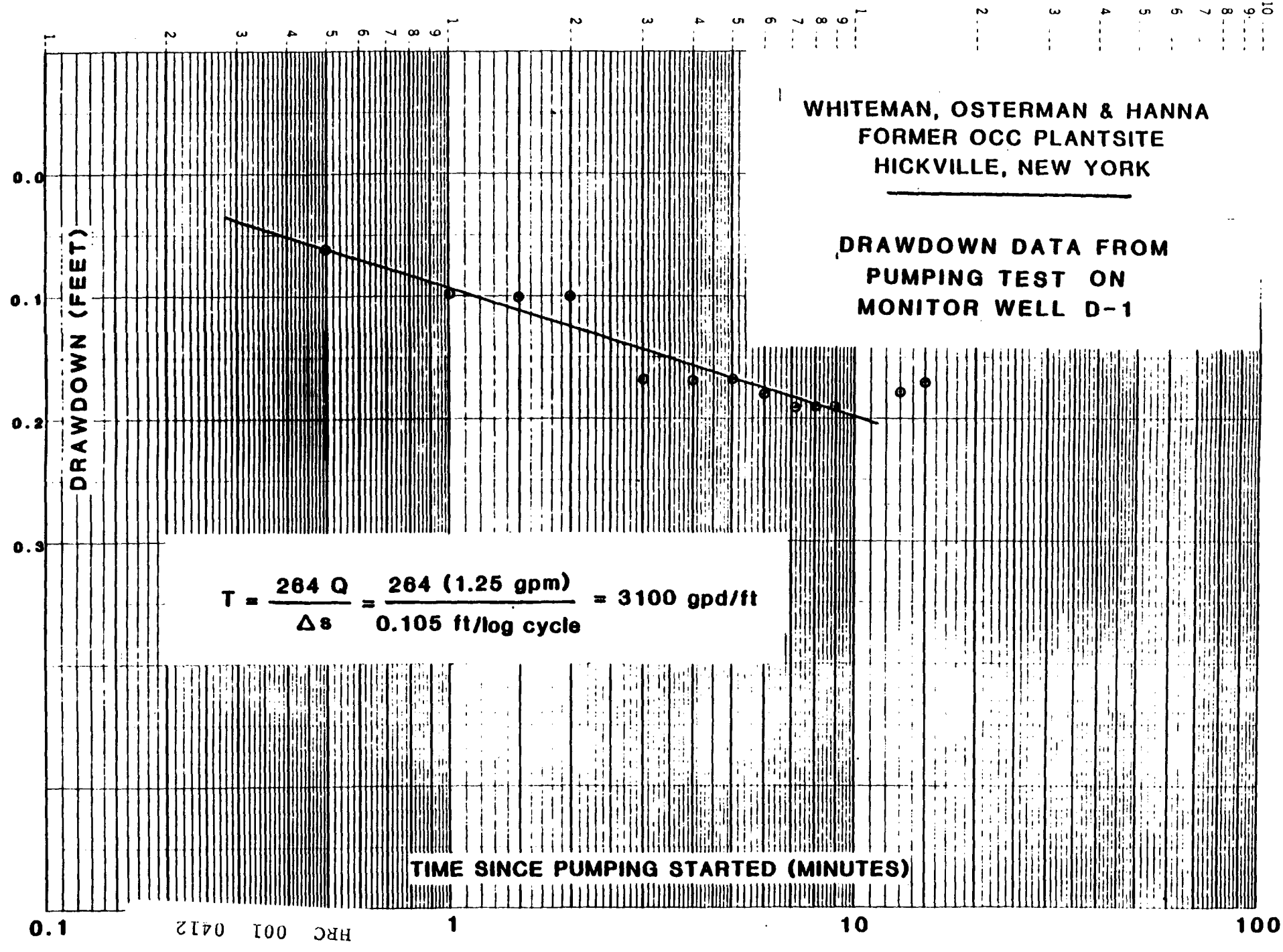


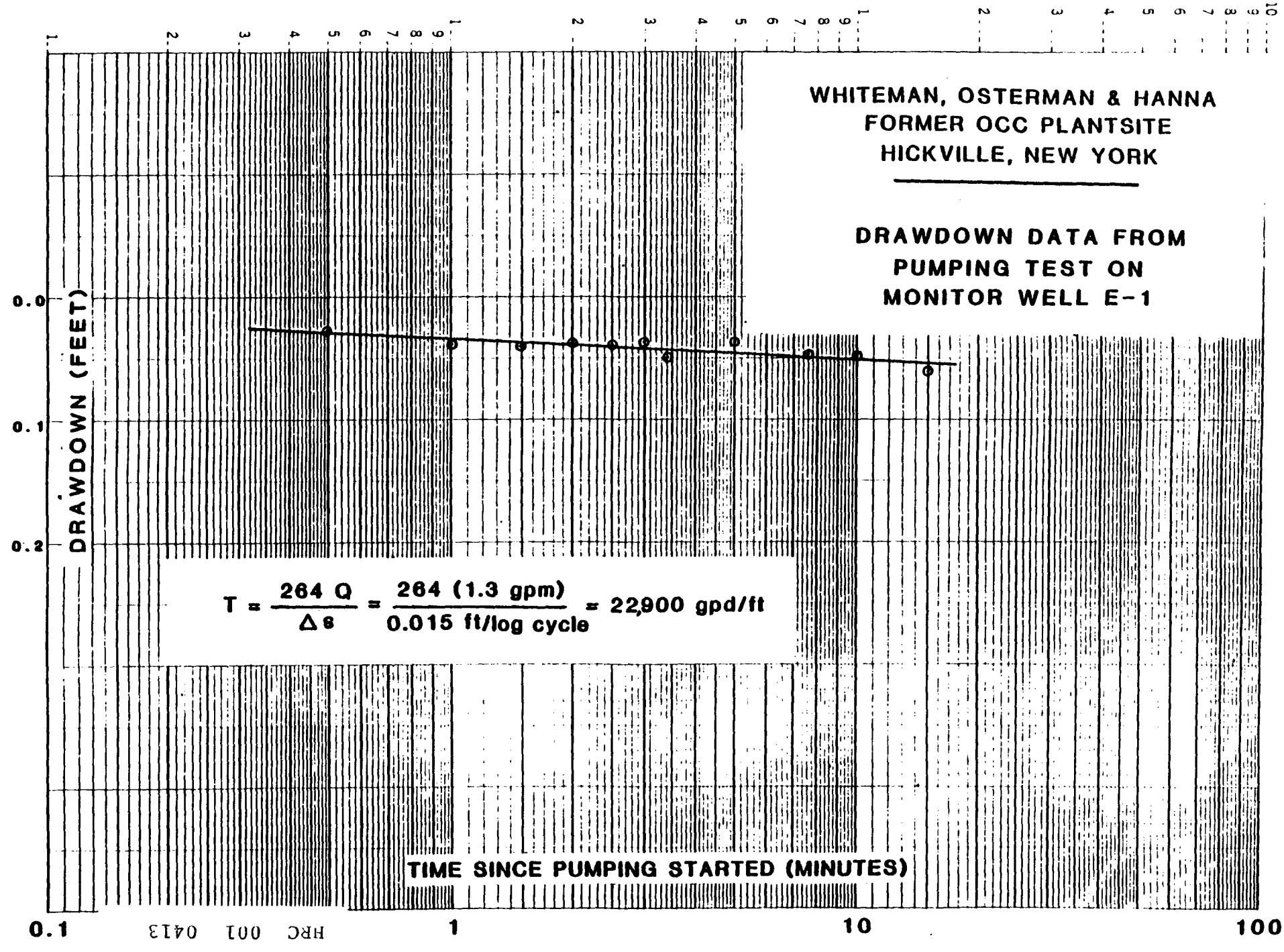


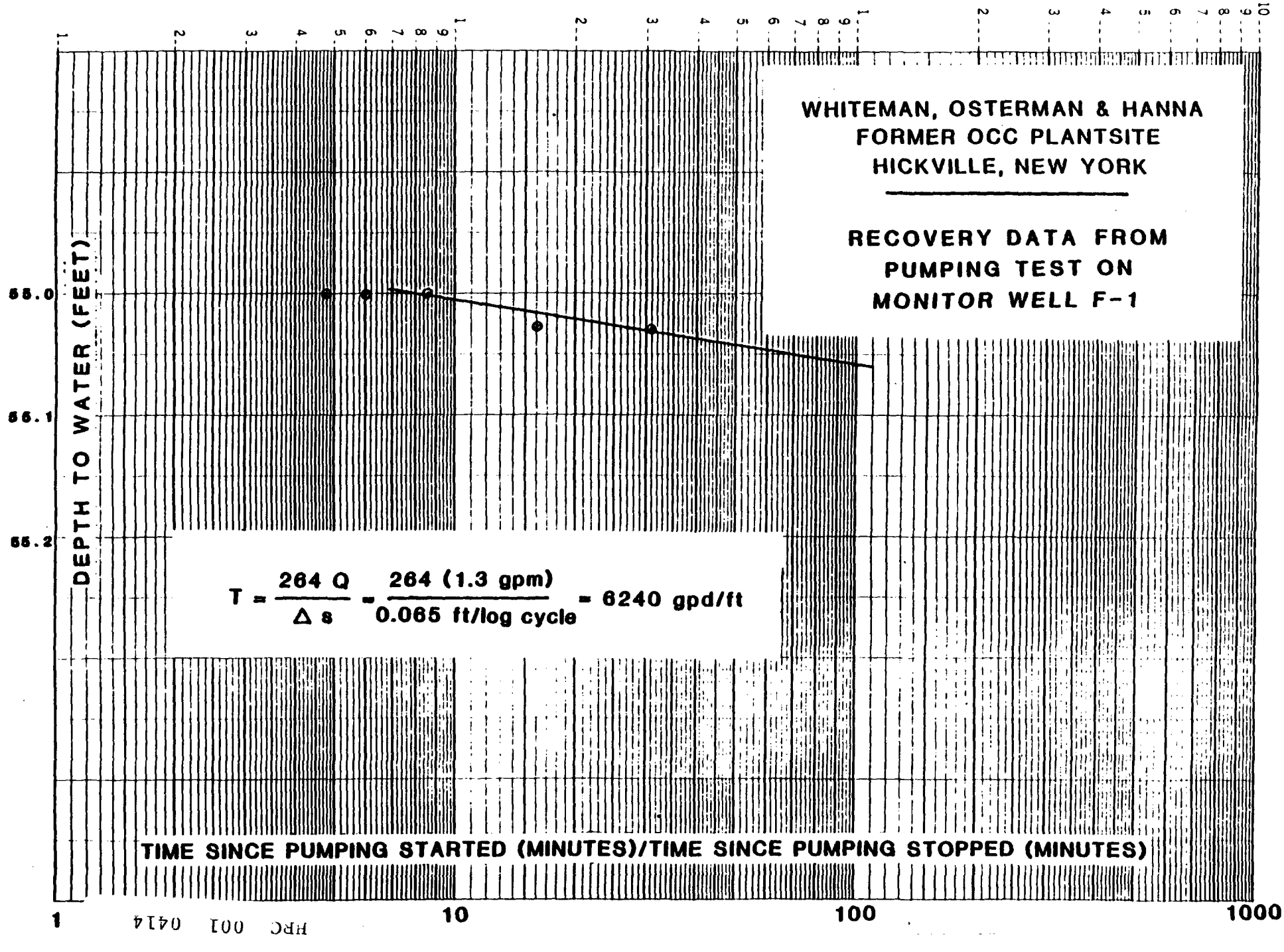
A P P E N D I X III

TRANSMISSIVITY TEST ANALYSES









APPENDIX B-1

PROPOSED HICKSVILLE PLANT GROUNDWATER STUDY

PROPOSED HICKSVILLE PLANT GROUNDWATER STUDY

A study of the groundwater and certain soils at the Occidental Chemical Corporation's former Hicksville plant (Hicksville, Long Island, New York) is being planned. The work will be divided into two tasks, sampling and analytical. The requirements for both of these tasks are outlined in this document to aid in the estimation of the cost of the program.

I. SAMPLING

Sampling will be performed by a two-person team with experience in environmental sampling. The senior member of the team will be responsible for complete documentation of sampling which will be kept in a field notebook with bound pages, appropriately dated and signed. The sampling team will be responsible for supplying proper sample containers, the filtration of water samples, for the preservation of all samples and performing any tests required in the field. The team also will maintain chain of custody records for all samples until they are shipped to the analytical laboratory.

Twelve (12) well sites will be sampled for water and samples of soil will be taken during the construction of six (6) of these wells. Six (6) of these wells will be screened at the 50-70 ft. depth and six (6) will be screened at the 80-100 ft. depth. Additional soil samples will be taken at 4 to 7 other sites during the same time that the wells are being constructed.

Groundwater Details

Wells will be sampled after pumping at least four volumes of the well casing, or until the well has been completely evacuated, whichever comes first. Placement of the pump inlet tubing should be such as to assure that the water in the casing will be exchanged with fresh water from the aquifier. Pumping and sampling will be performed using a peristaltic, centrifugal or gas lift pump which contain materials of construction shown not to compromise or contaminate the sample in any way. Samples for volatile organics will be taken by bailing after the well has been purged. With the exception of the Group A compounds, all water will be pressure filtered using a 0.5u pore size "Teflon" membrane filter and placed into an appropriate sample container. Group A compounds will be taken and analyzed as unfiltered samples (after any solids have separated by settling or mild centrifugation). The sample must be properly preserved as noted in Table I and stored at 4^{o} C until analysis.

Detailed preservation techniques are noted in reference (1). Conductivity and pH measurements will be made on unfiltered samples in the field.

Soil Details

Soil samples at well sites will be taken during well construction at approximately five (5) foot intervals in the unsaturated zone. A 2"x24" split spoon driven in advance of the auger will be the mode of sampling. The top six (6) inches of the split spoon sample will be discarded in all cases and the remainder will be placed in a suitable size glass jar with a "Teflon" lined screw cap. All soil samples will be cooled to 4°C for transportation to the laboratory. It is expected that separate samples (using special precautions to avoid loss of volatiles) will be taken for volatiles analysis.

Soil samples in the Therminol handling area will be taken by continuous split spoon sampling to a depth of approximately 6 feet. The initial sampling will be at the center of the handling area and 10 feet from the center in three radial directions. If contamination is found in the initial samples, additional sampling will be required to define the area of contamination.

Sampling Cleanup

Cross contamination between sites for either water or soil sampling must be avoided. This can be done either by dedicated pumping equipment for water or by rigorous clean up between sites (for water) or samples (for soil). Details on the procedures to protect sample integrity should be provided.

II. METHODOLOGY

Table 2 contains the groupings of those compounds which must be determined in the samples. The required detection limits are also included.

Groundwater

VOA Group A. EPA Method 624 is required using GC/MS for quantitation. Styrene has been included as per the attached memo (Simon, N., September 29, 1982).

phthalates, base neutrals Group B. EPA Method 625 is required using GC/MS for quantitation. MOCA has been included as per the attached memo (Simon, N., September 29, 1982).

PCB's Aroclor Group C. EPA Method 608 is required using GC/EC for quantitation.

Nitrates Sulfates Metals Group D. The required EPA Methods are listed in Table II.

Soil

VOA Group A. The required method is a modification of a Midwest Research Report (5). The specific modifications of this method are found in the attached report (Simon and Johnson, August 16, 1982). Quantitation will be by GC/MS.

Base neutral phthalates Group B. The soil will be prepared by obtaining an aqueous extract of the soil using the EPA's EP Toxicity digestion procedure 2. The aqueous extract will be analyzed using EPA Method 625 and GC/MS for quantitation. The limits of detection stated in Table II are based on the limits for the aqueous extract using Method 625 and related back to the original soil sample.

Aroclor Group C. The required method is that described in Reference (3). In cases of interferences from organochlorine pesticides, an additional clean-up procedure, as outlined in Section 9C of the same manual, will be considered. Quantitation will be by GC/EC. NOTE: Due to the nature of the program, special priority should be given these samples to obtain the most rapid turnaround possible. Please state what this will be.

Nitrates Metals Sulfates Group D. The required EPA procedures listed in Table II will be carried out on an aqueous extract of the soil obtained by using the EPA's EP Toxicity digestion procedure (2). The parameters of pH, conductivity COD and TOC will not be required for soils.

The USEPA Methods defined above may be modified in your proposal if valid technical reasons exist. In all cases, your proposed methodology must attain the expected detection limits and be fully documented. Full verification of any non-EPA methods must be made.

III. QUALITY ASSURANCE

As a general rule, EPA practices outlined in Reference (4) will be followed. In particular, the following QC procedures will be required for every batch of samples or at a minimum of every ten samples:

(1). Replicate sample analysis as randomly selected by the contractor with approval of the project liaison.

(2). Recovery of all analyzed compounds at two to three times the detection limit using laboratory distilled water.

(3). Recovery of spikes made to a sample selected by the contractor with approval of the technical liasion. Spiking will be done for all analyzed compounds at a level which approximately doubles the concentration found in the sample. In samples where compounds of interest are not detected, spiking must be at levels not exceeding two to three times the detection limit.

(4). Reagent and method blanks.

All standards used for quantitation must be traceable to a verified standard; that is, a compound whose purity has been determined by at least two different analytical procedures. A linearity of detector response for each compound must be demonstrated by generation of a linearity curve containing five concentrations of that compound. All sample calculations must be made from responses which fall within this linear range. During the course of the analysis, standards must be interspersed at frequent intervals to check the calibration. The preparation of all standards including purity verification, dilutions, linearities, etc. must be recorded in the bound notebook.

Samples and extracts must be retained and properly stored until time of disposal. After acceptance of the final report by Occidental, the contractor must request and receive permission prior to disposing of samples.

Records containing all relevant data must be easily accessible and kept for a specified period of time as determined by Occidental's technical liaison. These records must include all logbooks, workbooks, worksheets, graphs, charts and/or any records of pertinent nature relating to this study.

All chromatography scans must remain connected in the sequence in which they were generated, i.e., no scans shall be cut, torn or otherwise removed from the body of the chromatographic data attached to it.

The final report must include sample identification information, methods used, analysts, and all samples and quality control data. The calculated data must include units of concentration and limits of detection given with the proper significant figures. In cases where compounds are not detected at or above the stated detection limit, the reporting protocol will be ND_x where x is the required detection limit. An assessment of analytical precision and accuracy must also be stated.

The contractor will designate a project manager who has direct responsibility for the technical aspects of the study. The project manager will be available for detailed technical reviews during the course of the program.

III. QUOTATION AND TECHNICAL PROPOSAL

One technical proposal should cover the complete sample program outlined above. It should contain the following:

(1): Documented methodology for each analysis.

(2). Detailed procedures for and the cost of sampling. Also, the precise number, size and type of samples required from each sampling point to allow the contractor to do all the analyses which may be necessary i.e. spikes, duplicates, etc.

(3). Timing for completion of analyses after receipt of samples. To include issuing of preliminary (verbal) and final (draft) reports.

(4). A separate cost estimate broken down by analysis and sample including necessary development work.

(5). An estimate of timing starting from receipt of samples to when a report including documentation, QA/QC and results can be expected.

One quotation should be submitted separately and cover the complete program. Included in the quotation should be the cost broken down by analysis and sample.

The technical proposal and quotation should be sent to our attorney, who will also refer any questions to the appropriate technical personnel.

John Hanna, Esq.
WHITEMAN, OSTERMAN AND HANNA
99 Washington Avenue
Albany, New York 12210
PHONE: 518/449-7600

DATE:_____

PREPARED BY:

_____
Daniel R. Thielen
Sr. Research Chemist
Central Sciences

_____
Richard G. Badger
Sr. Research Chemist
Central Sciences

/jb
03/02/83

REFERENCES

(1). "Handbook for Sampling and Sample Preparation of Water and Wastewater", EPA-600/4-82-029, Sept. 1982.

(2). "RCRA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", SW-846, May 1980.

(3). "Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA-600/8-30-038, June 1980, Section 11A.

(4). "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979.

(5). MRI Special Report No. 1, "Development of Analytical Test Procedures for the Measurement of Organic Priority Pollutants in Sludges and Sediments", June 26, 1979, Midwest REsearch Institute Project No. 4583-A.

TABLE 1
PRESERVATION METHODS - WATER

PARAMETER	PRESERVATION METHOD
VOLATILE ORGANICS	4° C
BASE/NEUTRAL ORGANICS	4° C
PCB'S	4° C
NITRATES	2ML H_2SO_4 PER LITER AND 4° C
SULFATES	4° C
CADMIUM*	ADD 1:1 REDISTILLED HNO_3 TO PH OF <2
MERCURY*	"
BARIUM*	"
COPPER*	"
LEAD*	"
ZINC*	"
COD	ADD SULFURIC ACID TO PH OF <2 AND 4° C
TOC	ADD H_2SO_4 OR HCL TO PH OF <2 AND 4° C
PHENOLICS	ADD H_3PO_4 TO PH OF <4, ADD 1G/L OF $CUSO_4$, AND 4° C

TABLE 2

ATTORNEY-CLIENT COMMUNICATION PREPARED AT THE REQUEST OF LEGAL COUNSEL IN CONTEMPLATION OF LITIGATION

GROUP A

VOLATILES FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
TETRACHLOROETHYLENE	10	100
TRICHLOROETHYLENE	10	100
DICHLOROETHYLENE	10	100
TOLUENE	10	100
VINYL CHLORIDE	5	100
STYRENE	10	100

GROUP B

BASE NEUTRAL FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
BIS(2-ETHYLHEXYL)PHTHALATE	10	100
BUTYL BENZYL PHTHALATE	10	100
DIETHYL PHTHALATE	10	100
DIMETHYL PHTHALATE	10	100
DI-N-BUTYL PHTHALATE	10	100
DI-N-OCTYL PHTHALATE	10	100
MOCA (3,3'-DICHLORO-4,4'-DIAMINODIPHENYLMETHANE)	25	250

GROUP C

AROCHLOR FRACTION	WATER DETECTION LIMIT(UG/L)	SOIL DETECTION LIMIT(NG/G)
AROCHLOR-1016	10	100
AROCHLOR-1221	10	100
AROCHLOR-1232	10	100
AROCHLOR-1242	10	100
AROCHLOR-1248	10	100
AROCHLOR-1254	10	100
AROCHLOR-1260	10	100

GROUP D

OTHER PARAMETERS	WATER AND SOIL OPTIMUM RANGE	USEPA METHOD #
NITRATES	0.1 TO 2.0MG NO -N/LITER	352.1
SULFATES	3 TO 400 MG SO /LITER	375
CADMIUM*	0.05 TO 2 MG/LITER	213.1
MERCURY*	>0.2 UG/LITER	245.1
BARIUM*	1 TO 20 MG/LITER	208.1
COPPER*	0.2 TO 5 MG/LITER	220.1
LEAD*	5 TO 100 UG/LITER	239.2
ZINC*	0.05 TO 1 MG/LITER	289.1
CONDUCTIVITY	--	120.1
PH	--	150.1
COD	20 TO 900 MG/LITER	410.4
TOC	>1 MG/LITER	415.1
PHENOLICS	>5 UG/LITER	420

* - THE DETECTION LIMIT IS BASED ON THE ANALYSIS OF AN AQUEOUS EXTRACT AND RELATED BACK TO THE ORIGINAL WEIGHT OF THE SOIL.

** - THE DETECTION LIMIT IS BASED ON THE ANALYSIS OF THE WATER OBTAINED FROM THE AQUEOUS EXTRACTION OF THE SOIL(EP TOX).

Occidental Chemical Corporation
Research Center

MEMO

To A. F. Weston **Date** September 29, 1982

From N. Simon

Subject GC/MS Analysis of Styrene, Moca, Phthalates and Five Volatile Organics

COPIES: D. Johnson, P. Skotnicki, R. Badger, TIC

I. SUMMARY

The EPA Priority Pollutant Method for base neutral organics was extended to include styrene and 3',3'-dichloro 4,4'-diamino diphenyl methane (MOCA). Standard curves were generated and extraction efficiencies calculated. Detection limits were set at 10 µg/L for styrene and 25 µg/L moca. The volatiles analyses could also be used to analyze for styrene and appears to be the preferred method.

A. Extractables

1). Instrumental Parameters

Gas Chromatographic Conditions (Finnigan 96100)

Column		- 15 m DB5-NB fused silica capillary (J&W)
Carrier		- Helium 15.0 psi
Injector Temperature		- 275°C
Injection		- Grob, 60/1 split after 60 seconds
Detector Temperature		- 275°C
GC/MS Interface		- 265°-275°C
Column Program	1)	- 20° to 250° at 10°/minute after a 1 minute hold at 20°, hold at 250° for 20 minutes.
	2)	- Without styrene - 50° to 250°.

Mass Spectrometer Conditions (Finnigan 4000)

Instrument	- Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	- 85°, Electron Impact Source with 70eV ionizing electrons
EM Volts	- 1380 volts
Scan Parameters	- Total scan sequence - .5 second consisting of acquisition during .45 second up scan, .05 second hold at bottom. Mass range scanned 350-45.

2). Sample Preparation

for the base neutral extraction, one liter of sample was adjusted to pH 11 with 6N NaOH; extracted three times with methylene chloride according to EPA protocol; dried through a sodium sulfate column; and concentrated to 5 ml using a Kuderna-Danish evaporator and nitrogen.

An internal standard, deuterated phenanthrene was added 15 minutes prior to the analysis.

3). Standard Preparation

A stock solution containing the six phthalates was purchased from Supelco. Styrene and MOCA standards were prepared in-house. The standards were prepared to give 1,5,10 and 20 times the detection limit. The detection limit for MOCA was set at 25 µg/L to give a relatively equivalent response when compared to styrene and the phthalates at 10 µg/L.

4). Extraction Efficiencies

Since the method has routinely been used for phthalates it was only necessary to verify its efficiency for styrene and MOCA. Three blank water samples were spiked at 10X the detection limit, extracted and analyzed by the method noted above.

	% Recovery			
	Styrene		MOCA	
Sample	Day 1	Day 2	Day 1	Day 2
20832	51	55	72	88
20833	74	60	79	85
20834	88	74	69	83

The ions used to identify and quantitate were m/e 266, 268, and 131 for MOCA, and m/e 104, 102, 51 for styrene.

(B). VOLATILES

Extending Method 624 to include styrene.

(see Page 3 for Volatiles)

(B). VOLATILES

1) Instrumental Parameters

Purge and Trap Conditions
(Tekmar Liquid Sample Concentrator-Model LSC-2)

Plumbing	- Hard plumbed from trap effluent to the GC flow controller via a 1/8 inch O.D. copper line
Trap Column	- 12" x 1/4" stainless steel tubing packed with Tenax 60/80 mesh. Baked after each run at 250° for 20+ min.
Purge	- 12 minutes at 30 cc/minute
Desorb	- 4 minutes at 195°C
Sample Size	- 5 ml transferred by Blenco gas/liquid syringe

Gas Chromatographic Conditions (Finnigan 9610)

Column	- 8 foot by 1/4 inch (2mm I.D.) glass packed with 0.1% SP-1000 on Carbopack C
Carrier	- Helium at 30 cc/minute
Injector	- 180°C
GC/MS Interface	- 250°
Column Program	- 50° for purge, desorb and three minutes after desorb, 8°/min. to 180°; held for 30 min. at 180°

Mass Spectrometer Conditions

Instrument	- Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	- 260°, Electron Impact Source with 70 eV ionizing electrons
Manifold Temperature	- 90°
Electron Multiplier	- 1080 volts
Scan Parameters	- Total scan sequence of 2 seconds consisting of data acquisition during 1.95 sec. up scan, 0.05 sec. hold at bottom. Mass range scanned 45-270.

2. Standards

The standards used were supplied by Supelco and are described as "Standards for EPA Consent Decree Protocol". They are further referenced to (I.F.B. No. WA77-B133, Appendix B, Sampling and Analysis for Priority Pollutants, US EPA). A solution of styrene at the same concentration as the above standards, was prepared in the lab.

Bromochloromethane, 2-Bromo-1-chloropropene and 1,4-dichlorobutane were used as internal standards.

The stock solutions, as received from Supelco, were stored in a freezer. Dilutions were stored in the refrigerator in 15 ml hypovials until one hour before analysis. Standards were prepared to give concentration levels of 10 µg/L (50 ng injected) and 100 µg/L (500 ng injected). An additional standard at 25 µg/L (125 ng injected) was analyzed to verify linearity. Internal standards were prepared at 20 µg/L; 5 µl (100 ng injected) was used to spike each standard and sample.

Standards were stored in the refrigerator until one hour before analysis.

Standards were poured into a 5 ml syringe; the volume adjusted; the needle removed and 5 µl internal standard added immediately before injection into the Tekmar.

Standards could be prepared by weighing pure materials into methanol instead of using the commercial mix since only five of the priority pollutants are required: perchloroethylene, trichloroethylene, trans-1,2-dichloroethylene, toluene, and vinyl chloride. It should also be noted that the required detection limit for VCM is 5 µg/L while the detection limit for the other volatile components is 10 µg/L.

3. Results and Discussion

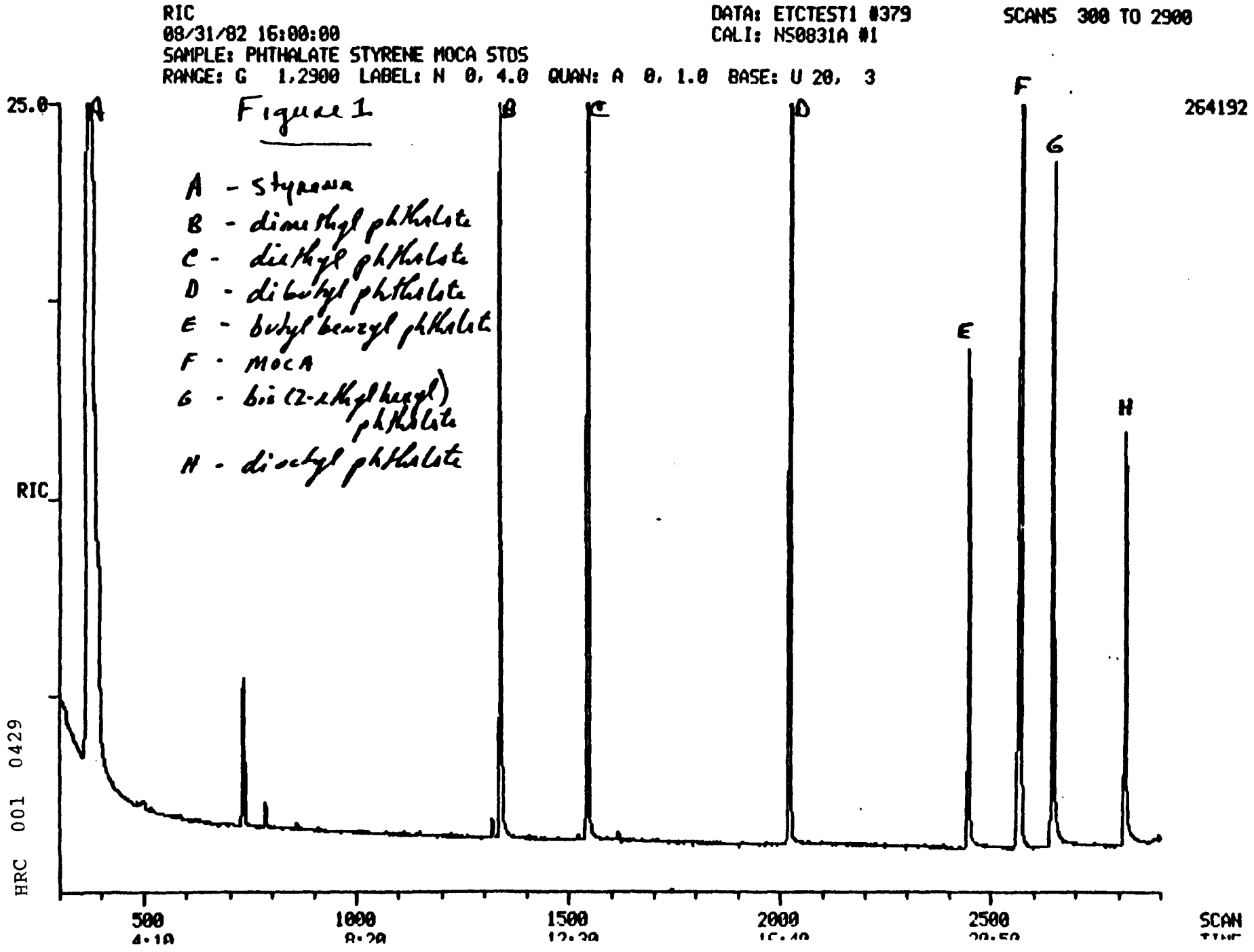
The EPA Priority Pollutant base neutral method can be extended to include styrene and MOCA. The chromatogram following (Figure 1) demonstrates the relative retention times of styrene and MOCA compared to the phthalates.

It seems preferable to analyze styrene with the volatiles rather than the extractables for a number of reasons: The gas chromatographic oven will not need subambient conditions to separate styrene from the solvent (see Figure 2); loss of styrene will not be a problem; a narrower range of internal standards will be acceptable, styrene carryover will be limited in the volatiles analysis, etc.

The RIC's from the analyses (Figures 1,2,4) and the mass spectrum of MOCA (Figure 3) follow.

Nan Simon
Central Sciences

jmw/


RIC
08/31/82 16:00:00
SAMPLE: PHTHALATE STYRENE MOCA STDS
RANGE: G 1,2900 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3
DATA: ETCTEST1 #379
CALI: NS0831A #1
SCANS 300 TO 2900
Figure 1
A - Styrene
B - dimethyl phthalate
C - diethyl phthalate
D - dibutyl phthalate
E - butyl benzyl phthalate
F - MOCA
G - bis(2-ethylhexyl) phthalate
H - dioctyl phthalate
25.0
264192
RIC
HRC 001 0429
500
1000
1500
2000
2500
SCAN

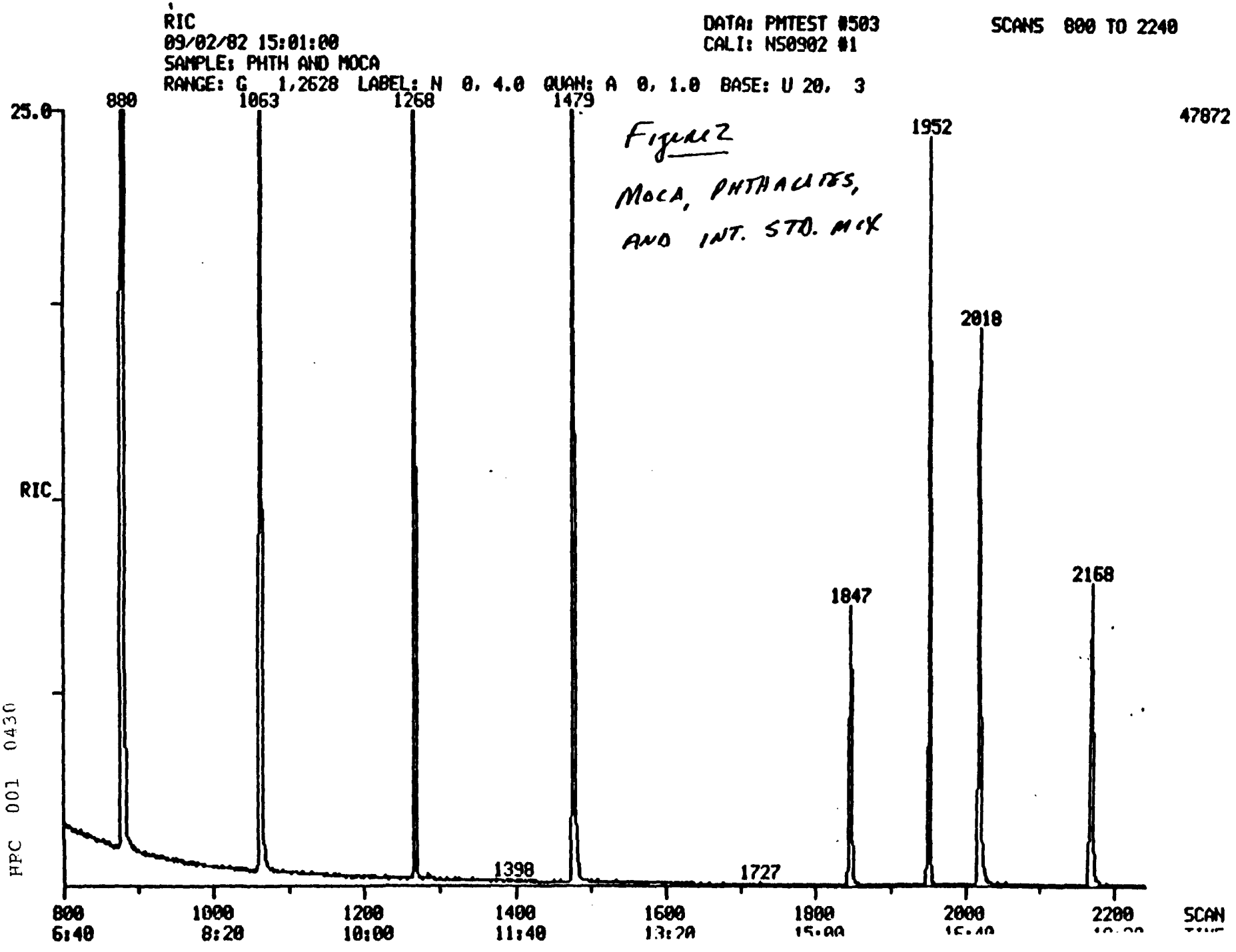
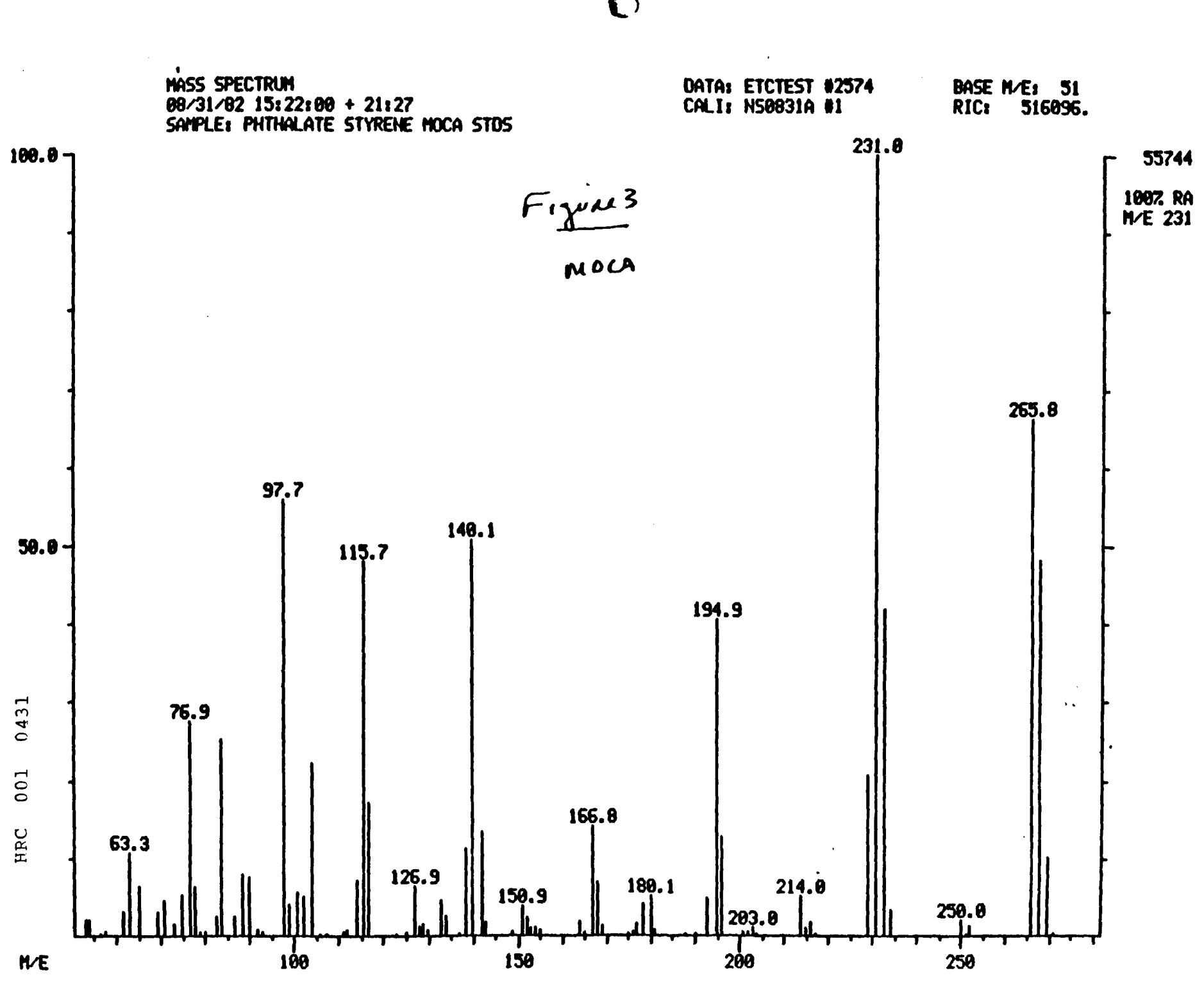
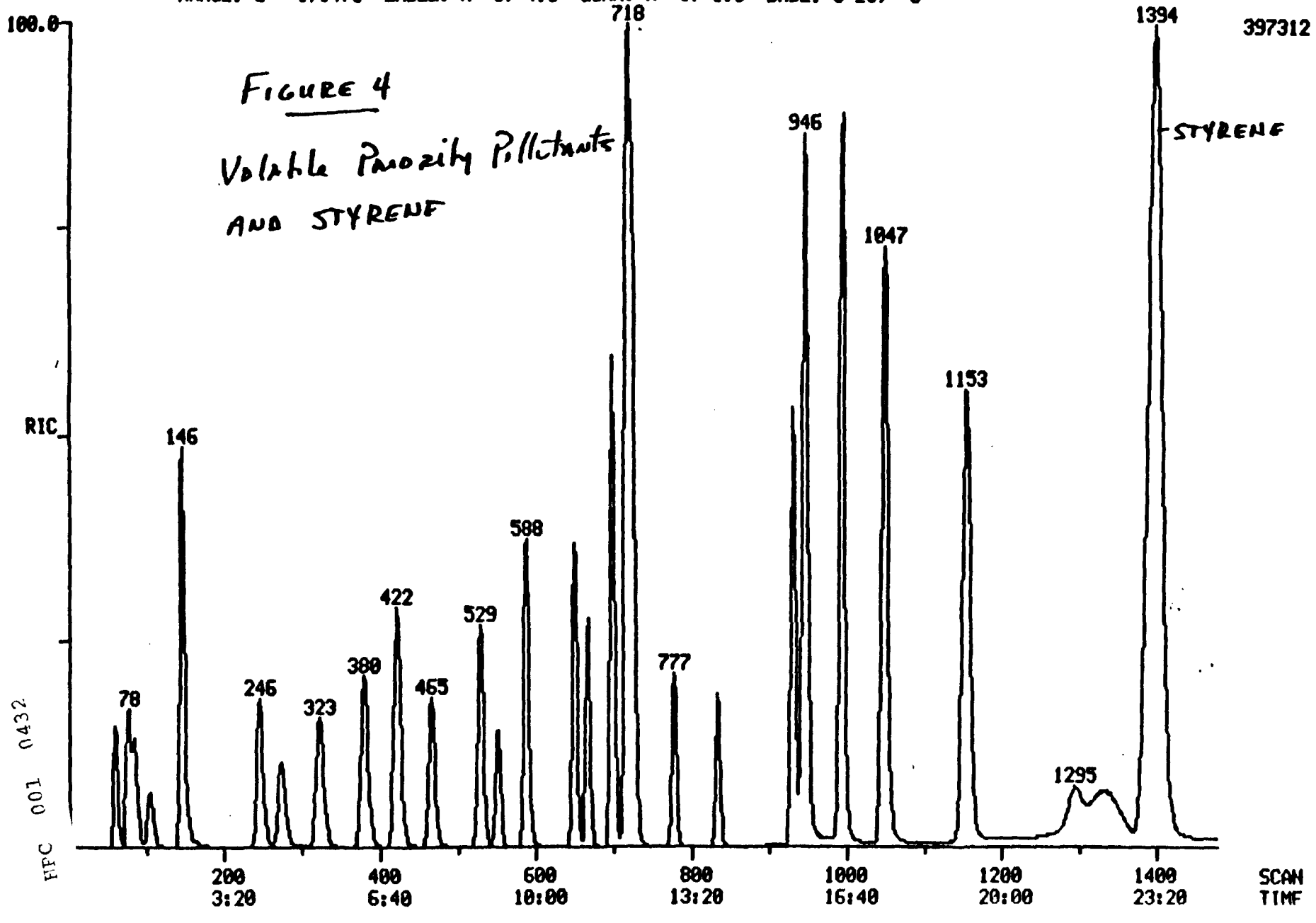


Figure 2

MOCA, PHTHALATES, AND INT. STD. MIX


MASS SPECTRUM
08/31/02 15:22:00 + 21:27
SAMPLE: PHTHALATE STYRENE MOCA STDS
DATA: ETCTEST #2574
CALI: NS0831A #1
BASE M/E: 51
RIC: 516096.
Figure 3
MOCA
100.0
50.0
55744
100% RA
M/E 231
231.0
265.0
97.7
140.1
115.7
194.9
76.9
63.3
166.8
126.9
150.9
180.1
214.0
203.0
250.0
M/E
100
150
200
250
HRC 001 0431


RIC
09/03/82 10:50:00
SAMPLE: VOLATILES WITH STYRENE
RANGE: G 1,1476 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3
DATA: VPPSTD #1332
CALI: 0903DJ #3
SCANS 1 TO 1479
100.0
397312
FIGURE 4
Volatile Priority Pollutants
AND STYRENE
718
1394
STYRENE
946
1047
1153
1295
588
422
529
380
246
323
465
777
146
78
RIC
HPC 001 0432
200
3:20
400
6:40
600
10:00
800
13:20
1000
16:40
1200
20:00
1400
23:20
SCAN
TIME

hooker

August 16, 1982

To: R. Hall

From: N. Simon, D. Johnson

Distribution: P. Skotnicki, A. Weston

Reference: GC/MS Analysis of Soil Samples for Volatile Priority Pollutants

I. Summary

This report summarizes the GC/MS sample preparation and analyses of six soil samples taken at the Arecibo facility on 8/ /82. The methodology used was as developed for the EPA. It is considered semi-quantitative because of variances in the sampling, sample handling and the sample matrix.

Sample 00003 (STP Plant across from PRC/sewer bottoms in sewer dumping spot #5) was the only sample where priority pollutant volatile organics were detected at greater than 10 ug/L. The compounds found were benzene, toluene and chlorobenzene. Vinyl chloride, 1,1-dichloroethylene, trans-1,2-dichloroethylene and trichloroethylene were not detected in any of the samples. Toluene was only detected in 00003. Non-volatile priority pollutants found were xylenes in sample 00003 and dichlorobenzene in 00092.

II. Experimental

The EPA priority pollutant method is described in Special Report No. 1 "Development of Analytical Test Procedures for the Measurement of Organic Priority Pollutants in Sludges and Sediment", published June 26, 1979 under contract No. 58-03-2695, MRI Project No. 4583-A. The only significant deviation from the published method was the use of a larger sample to give a lower detection limit.

A. Instrumental Parameters

Purge and Trap Conditions
(Tekmar Liquid Sample Concentrator-Model LSC-2)

Plumbing	-	Hard plumbed from trap effluent to the GC flow controller via a 1/8 inch O.D. copper line.
Trap Column	-	12" X 1/4" stainless steel tubing packed with Tenax 60/80 mesh. Baked after each run at 250^{0} for 20+ min.
Purge	-	12 minutes at 30 cc/minute
Desorb	-	4 minutes at 195^{0}C
Sample Size	-	0.5g in 5ml distilled water

Gas Chromatographic Conditions (Finnigan 9610)

Column	-	8 foot by 1/4 inch (2 mm I.D.) glass packed with 60/80 Carbopack C/0.2% CW 1500
Carrier	-	Helium at 25 cc/minute
Injector	-	180°C
GC/MS Interface	-	250°
Column Program	-	50° for purge, desorb and three minutes after desorb; 8°/min. to 180°; held for 30 min. at 180°

Mass Spectrometer Conditions

Instrument	-	Finnigan 4000 GC/MS interfaced with an Incos Data Acquisition System
Source Parameters	-	260°, Electron Impact Source with 70 eV ionizing electrons
Manifold Temperature	-	90°
Electron Multiplier	-	1330
Scan Parameters	-	Total scan sequence of 1 second consisting of data acquisition during 0.95 sec. up scan, 0.05 sec. hold at bottom. Mass range scanned 45-180

B. Sample Preparation

The sample for each site was received in a wide mouth glass quart bottle with a teflon cover. (There was considerable head space in each bottle). One half ml. (∿ 0.5g) was transferred, using a tipless disposable pipet, to a Tekmar tube. Five mls of distilled water and 5 ml of an internal standard solution were added. The tube was immediately attached to the Tekmar and purged.

Since the samples did not appear to be homogenous and since there was one to three inches of headspace, the 0.5ml aliquot was taken from the bottom half of the bottle and each sample was analyzed in duplicate.

The samples were refrigerated until one hour before analysis.

C. Standards

The standards used were supplied by Supelco and are described as "Standards for EPA Consent Decree Protocol". They are further referenced to (I.F.B. No. WA77-B133, Appendix B, Sampling and Analysis for Priority Pollutants, US EPA).

Bromochloromethane, 2-Bromo-1-chloropropene and 1,4-dichlorobutane were used as internal standards.

The stock solutions, as received from Supelco, were stored in a freezer. Dilutions were stored in the refrigerator in 15 ml hypovials until one hour before analysis. Standards were prepared to give concentration levels of 10 µg/L (5 ng injected) and 100 ug/L (50 ng injected). An additional standard at 50 ug/L (25 ng injected was analyzed to verify linearity. Internal standards were prepared at 20 µg/L; 5 µl (100 ng injected) was used to spike each standard and sample.

III. Quality Assurance

All six samples were analyzed in duplicate. A blank was prepared using 1/2 ml of soil and 5 mls of distilled water. The blank was analyzed each day to verify the absence of sample handling contamination. Three spiked samples were prepared at 10 or 20 ug/L, two from the lab blank and one an actual sample.

Linearity was verified with a three point curve (10, 50 and 100 ug/L) and a three component internal standard was added to each sample and standard.

The significant amount of headspace and the non uniformity of each sample limits the quantitative conclusions that normally could be assumed with the rigorous quality assurance protocal. Sample 00003 was the most obvious example; a mixture of soil and black sludge that was impossible to accurately reproduce in the transfer.

IV. Results and Conclusions

The results are listed in Table 1. % recoveries from the three spikes are listed in Table 2. Chromatograms of each sample follow the tables.

Nan Simon

jmw/

attachments

TABLE 1

RESULTS SUMMARY

C.S. Log #	20811	20812	20813*	20814**	20815	20816
Sample I.D.	00061	00002	00003	00092	00090	00062
Chloromethane	ND	ND	ND	ND	ND	ND
Bromomethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Vinylchloride	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Chloroethane	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
Methylene Chloride	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
1.1-Dichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1-Dichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trans-1,2-Dichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Chloroform	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,2-Dichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1,1-Trichloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Carbon Tetrachloride	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
Bromodichloromethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,2-Dichloropropane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trans-1,3-Dichloropropene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Trichloroethylene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Dibromochloromethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Cis-1,3-Dichloropropene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Benzene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Bromoform	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}	ND_{50}
1,1,2,2-Tetrachloroethene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
1,1,2,2-Tetrachloroethane	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}
Toluene	ND_{10}	ND_{10}	19 11	ND_{10}	ND_{10}	ND_{10}
Chlorobenzene	ND_{10}	ND_{10}	134 66	ND_{10}	ND_{10}	ND_{10}
Ethylbenzene	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}	ND_{10}

* Xylenes also detected

** A significant amount of dichlorobenzene was detected

TABLE II

% RECOVERY FROM SPIKED SOIL

	D.L. ug/L	Blank Soil @ 10 ug/L	Blank Soil @ 20 ug/L	20811-00061 Soil @ 20 ug/L
Chloromethane	No std.	ND	ND	ND
Bromomethane	10	136%	103%	110%
Vinylchloride	10	103	105	117
Chloroethane	50	ND	ND	123
Methylene Chloride	10	143	161	550*
Trichlorofluoromethane	No std.	ND	ND	ND
1.1-Dichloroethylene	10	108	105	103
1,1-Dichloroethane	10	102	92	114
Trans-1,2-Dichloroethylene	10	100	94	111
Chloroform	10	106	97	100
1,2-Dichloroethane	10	140	100	110
1,1,1-Trichloroethane	10	109	102	121
Carbon Tetrachloride	50	ND	ND	ND
Bromodichloromethane	10	105	101	115
1,2-Dichloropropane	10	147	103	84
Trans-1,3-Dichloropropene	10	90	78	148
Trichloroethylene	10	84	76	95
Dibromochloromethane	10	82	98	101
Cis-1,3-Dichloropropene	10	143	100	110
Benzene	10	96	88	105
Bromoform	50	ND	ND	ND
1,1,2,2-Tetrachloroethene	10	158	155	144
1,1,2,2-Tetrachloroethane	10	83	74	67
Toluene	10	125	138	580*
Chlorobenzene	10	94	85	105
Ethylbenzene	10	108	98	124

* It can reasonably be assumed that the large recovery is contribution from the sample #20811 - identified as 00061. However, neither compound was found in the unspiked sample.

RIC
08/12/82 11:26:00
SAMPLE: SOIL SAMPLE #4 TANK TRUCK DISPOSAL PIT
RANGE: G 1,1376 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3

DATA: 20811 #1030 SCANS 1 TO 1300
CALI: 0812DJ #2

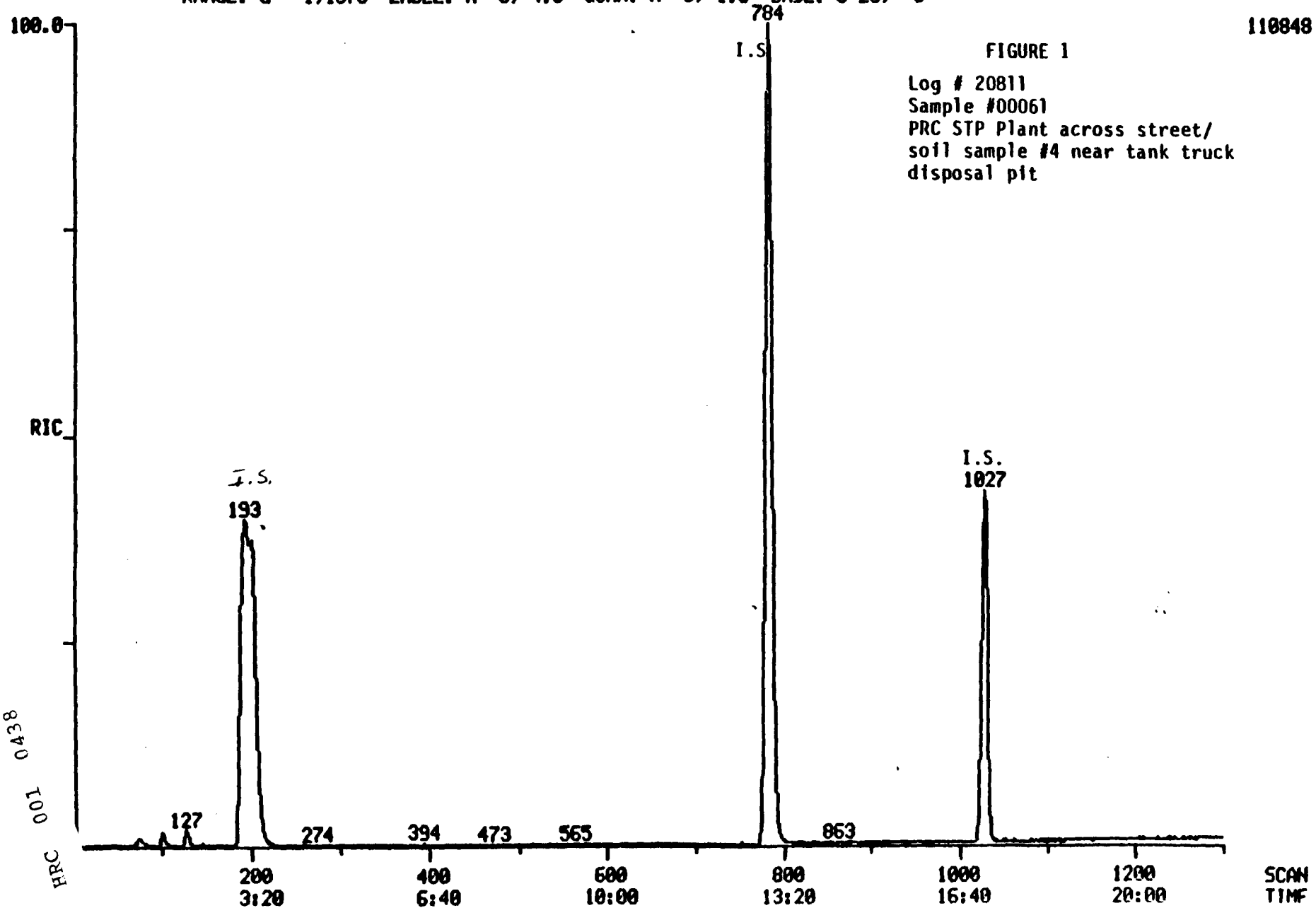


FIGURE 1

Log # 20811
Sample #00061
PRC STP Plant across street/
soil sample #4 near tank truck
disposal pit

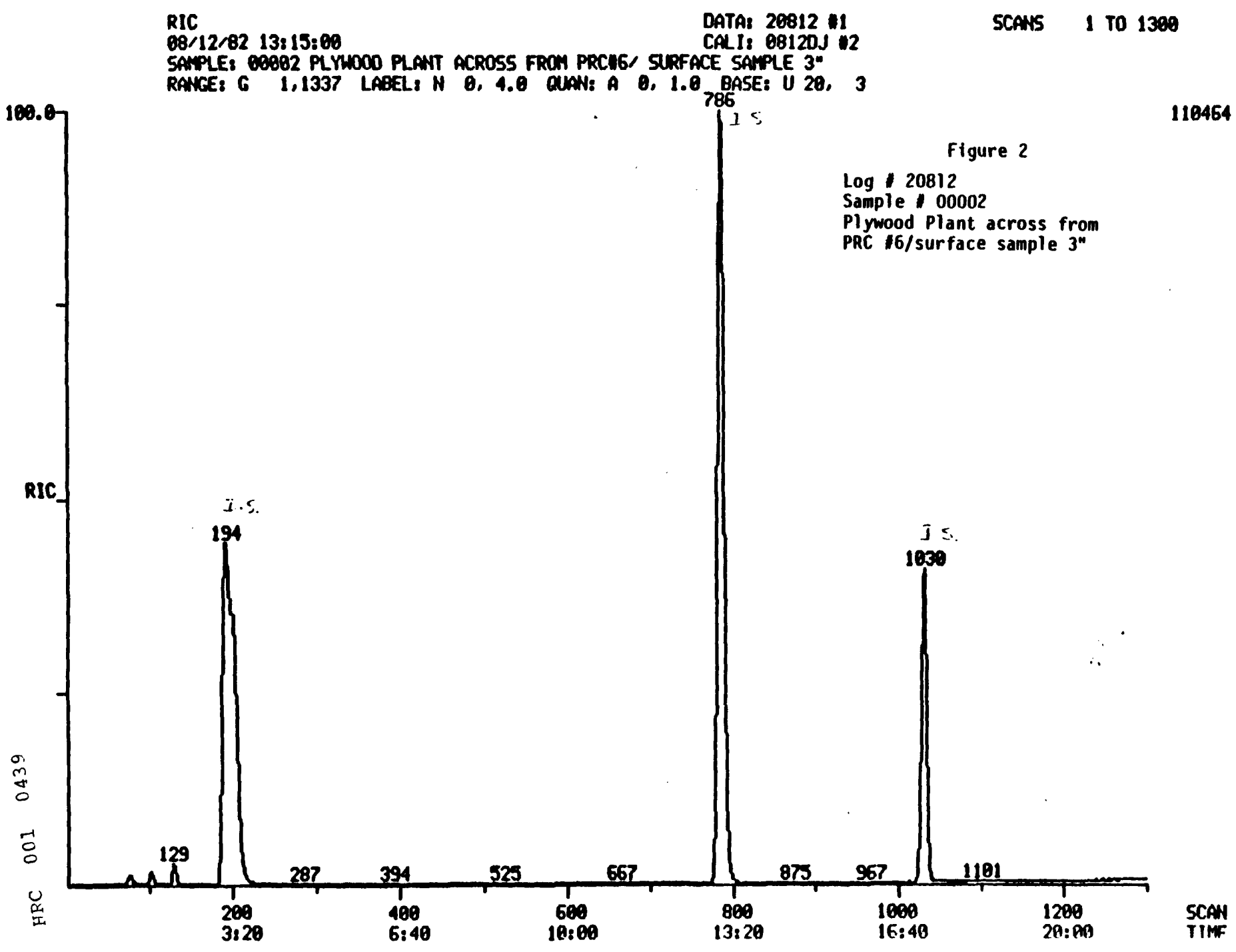


Figure 2

Log # 20812
Sample # 00002
Plywood Plant across from
PRC #6/surface sample 3"

RIC
08/12/82 13:49:00
SAMPLE: 00003 STP PLANT ACROSS PRC SEWER BOTTOMS IN SEWER DUMP SPOT #5
RANGE: G 1,1494 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3

DATA: 20813 #1
CALI: 0812DJ #2

SCANS 1 TO 1494

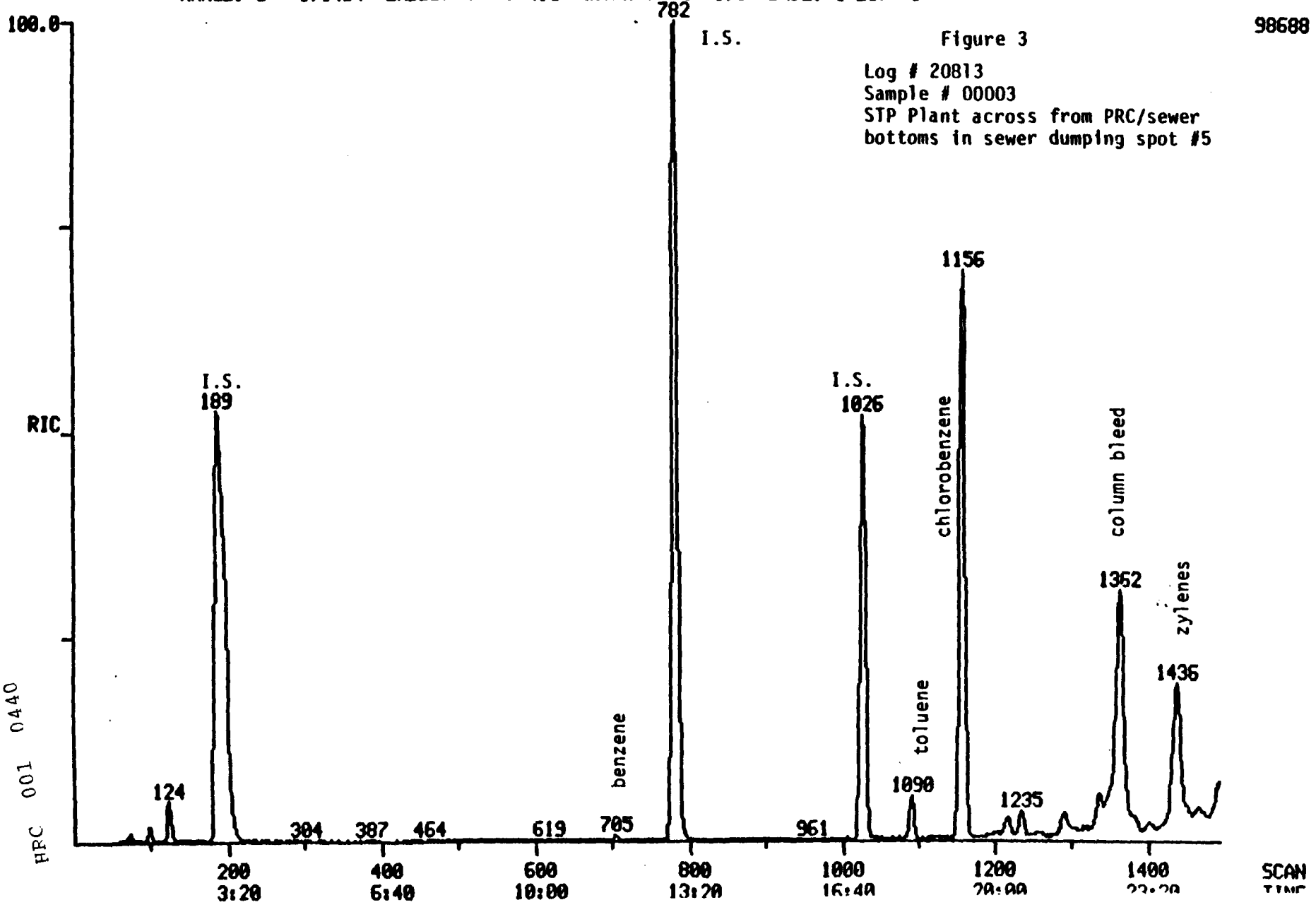


Figure 3

Log # 20813
Sample # 00003
STP Plant across from PRC/sewer
bottoms in sewer dumping spot #5

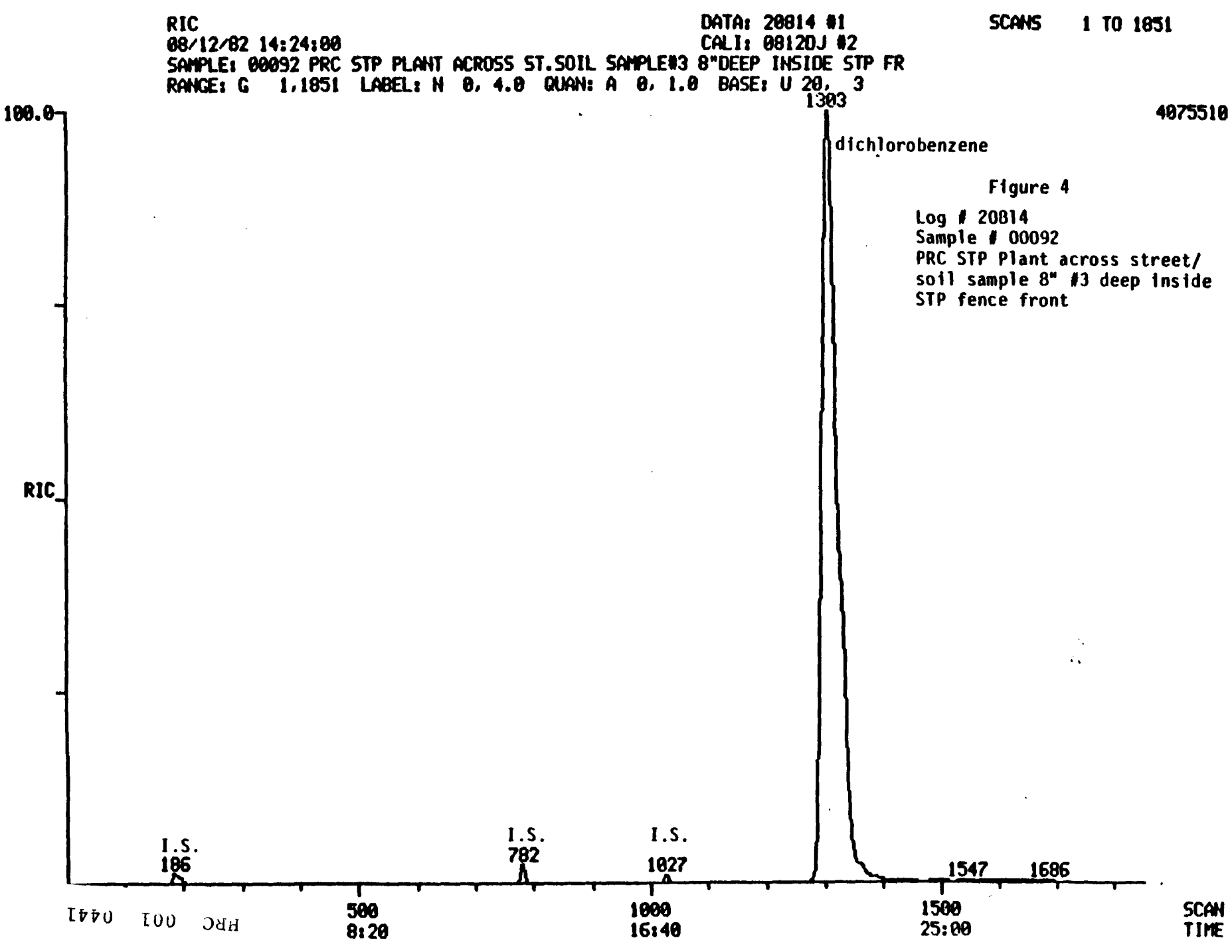


Figure 4

Log # 20814
Sample # 00092
PRC STP Plant across street/
soil sample 8" #3 deep inside
STP fence front

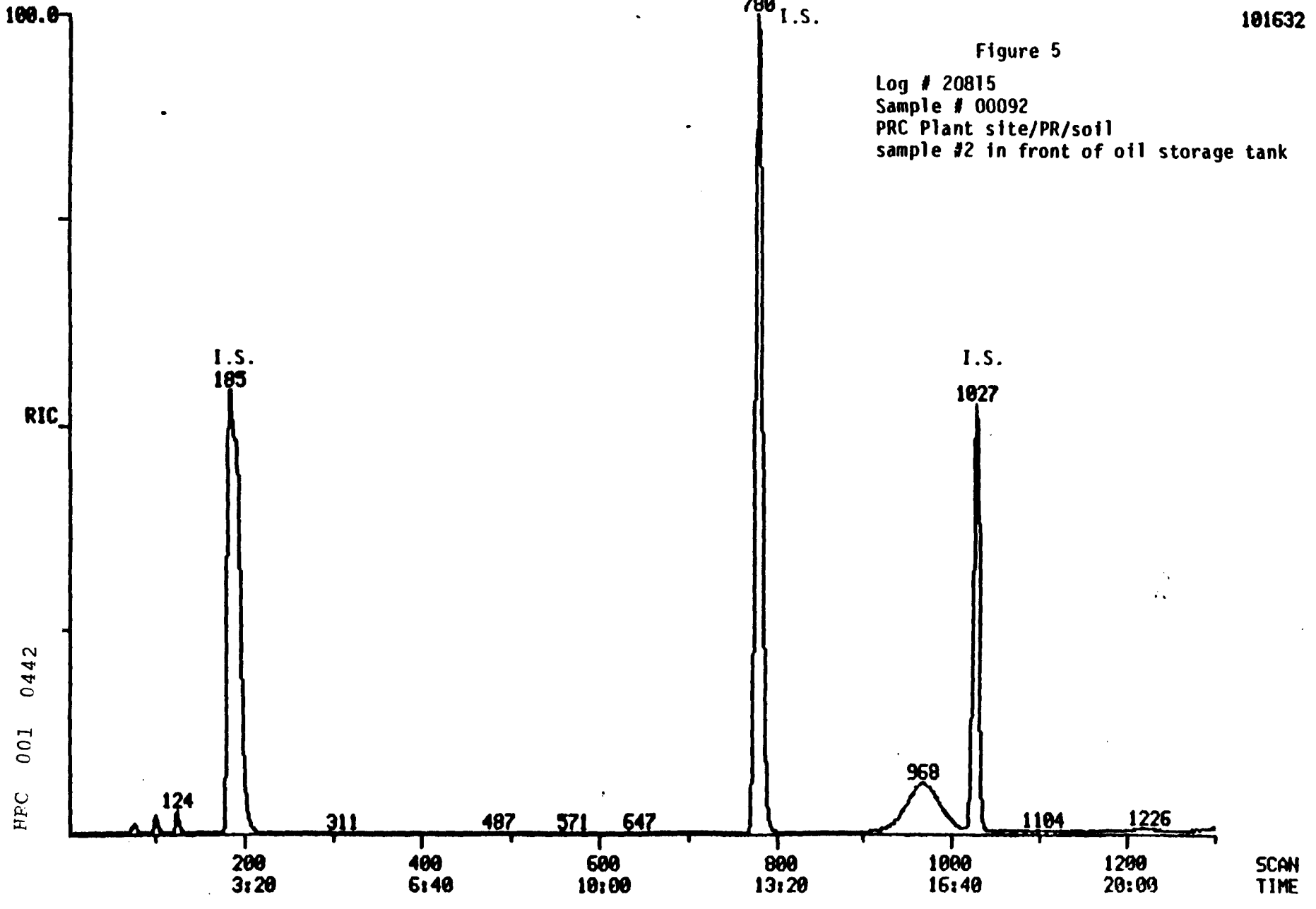


Figure 5

Log # 20815
Sample # 00092
PRC Plant site/PR/soil
sample #2 in front of oil storage tank

RIC
08/12/82 15:30:00
SAMPLE: 00062 PRC PLANT SITE SOIL SAM. #1 FRONT OF PLANT
RANGE: G 1,1389 LABEL: N 0, 4.0 QUAN: A 0, 1.0 BASE: U 20, 3

DATA: 20816 #1
CALI: 0812DJ #2

SCANS 1 TO 1300

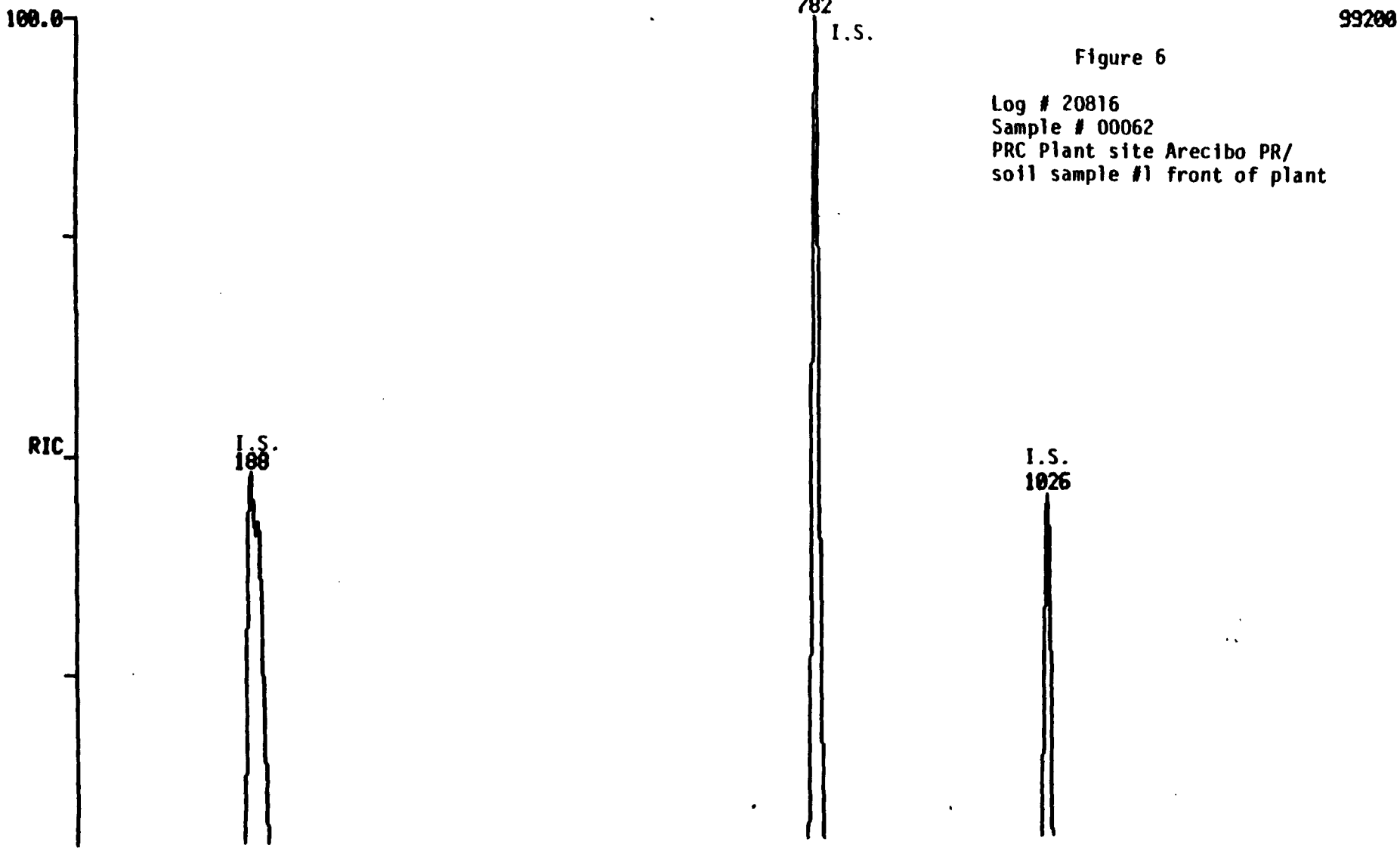


Figure 6

Log # 20816
Sample # 00062
PRC Plant site Arecibo PR/
soil sample #1 front of plant